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# SACRO-ILIAC RELAXATION; WITH ANALYSIS OF EIGHTY-FOUR CASES

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THAT the sacro-iliac joint is a true joint cannot any longer be disputed in view of the recent work done in orthopedic surgery in this connection. The earlier works and even some of the later textbooks on anatomy state that the sacro-iliac joint admits no motion. The obstetrical textbooks recognize that under certain physiological conditions, as during pregnancy and labor, the sacro-iliac synchondrosis yields and admits motion. But it has not been recognized until lately that the sacro-iliac joint acts as a true joint and admits some motion normally. Careful study of the pelvic joints by men who are constantly observing these cases, both clinically and anatomically, has brought to light in the last few years that under a wide range of conditions the pelvic joints are not staple but admit an abnormal amount of motion. In 1904, a paper published by Doctors Goldthwait and Osgood first called attention to the fact that certain symptoms, such as sciatica, lumbago, backache and the like, were frequently caused by an abnormal amount of motion in the pelvic joints, especially the sacro-iliac synchondrosis. Since then Doctor Albee in an article based upon actual work done in the dissecting room, has shown by means of injection of methylene-blue into the sacro-iliac joints of cadavers, that the joint is a true joint and has all the anatomical structures, as for instance, hyaline articular cartilage, synovial membrane, capsule, and supporting ligaments.

This paper is based upon pelvic joint cases seen by me in the past five years together with those cases seen previously, some of which while serving under Doctors Goldthwait, Painter, and Osgood. The cases which I herewith report are only those cases which I have had an opportunity to study carefully in my practice from a clinical and therapeutical standpoint. This study does not include all of the cases which have come under my observation because many were purposely omitted as either doubtful or having passed out of my hands after a diagnosis had been made, and in which the treatment and results could not be studied. From careful observation of these pelvic joint cases I have concluded that there are certain definite symptoms and etiological signs which may be deduced from the history, and which place these cases into one of the four types which are given below.

Upon determining the class to which a given case belongs, much of the success of the treatment depends. In presenting this classification I appreciate that some of the cases may be considered on the border line, and that it is only after a most careful and thorough examination of the patient and history, that a correct diagnosis, which is essential for successful treatment, can be arrived at. In the accompanying table the chief complaint only

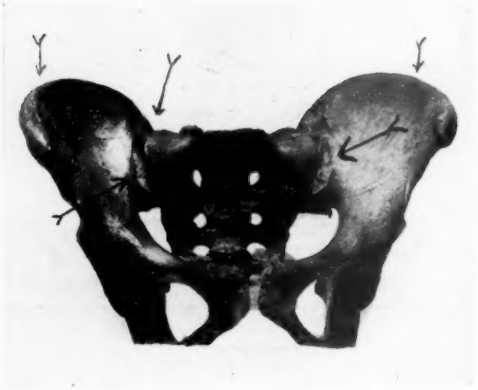

Fig. 1. Showing the sacro-iliac articulations, the sacrum tilted back leaving open joints on both sides. Note the way the sacrum is swung between the ossa innominata. Also that any downward pressure on the crests tends to separate the sacro-iliac joints.

is given. It must be remembered that many of the patients presented other subjective symptoms, especially those of the uterine and neurotic types. Most of the cases have been referred to me by other physicians, especially gynecologists. The diagnoses, other than orthopedic, have been confirmed by the physicians referring the cases and by physicians at my request in those cases which have come to me directly.

I herewith wish to express my thanks to my colleagues who have referred cases to me thereby making this study possible.

### BRIEF ANATOMY OF THE SACRO-ILIAC JOINT

The sacro-iliac joints are true joints presenting the anatomical features of other joints, namely, hyaline articular cartilage, synovial membrane, and a capsule. The thin articular cartilage is interposed between the adjoining surfaces of the sacrum and the ilia. The sacrum is hung wedge-shaped between the ilia. The articular surfaces are broad, flat, and somewhat irregular in shape, and include only half of the lateral aspects of the sacrum. The surfaces of the joints are oblique radiating forward and outward, downward and inward; thus the sacrum is suspended by its upper half and acts as a wedge between the ilia (Fig. 1). The axis of the sacrum is horizontal and passes through the middle of its upper segment, about two-thirds of its weight being below. Its compensating motion allows the promontory of the sacrum to move forward or backward. The sacrum and ilia are held in place by the anterior and posterior sacro-iliac ligaments. The lower portion of the sacrum is held by the sacrosciatic ligaments.

### GENERAL ANATOMY AND PHYSIOLOGY OF THE PELVIC GIRDLE

By consulting Figure 2, one can readily see that the pelvic girdle is the main support of the weight of the trunk, the viscera, and the upper extremities. The girdle is held together by ligaments. Reviewing the anatomy we note that the fifth lumbar vertebra is superimposed upon the sacrum, and that the sacrum is suspended between the two ilia; also that there are no other bony supports between the trunk and the lower extremities, the only true supports being the ligaments and the muscles. We find that there are practically two important antagonistic groups of muscles, namely, those radiating from the pelvis downward and those radiating from the sacrum upward. The muscles attached to the sacrum and supporting the spine and body in position radiate up the back, as for instance, the iliocostalis lumborum, the spinalis dorsi, the longissimus dorsi, and the other erector spinæ muscles, these radiating well up the trunk and connecting indirectly with those attached to the occiput. On the other hand we have an opposing group so to speak, radiating from the pelvis down the limbs, as for instance, the ilicus, glutei, and the hamstrings. These muscles exert their tension in opposite directions, and the resistance of their action is dependent upon the ligamentous structures holding the parts to which they are attached, i. e., the pelvic girdle, in place. When the trunk is moved to one side quickly there are direct opposing forces of the lumbar and spinal muscles against the pelvic and leg muscles. Normally these work in harmony and are resisted by the strong pelvic ligaments and fascia to a certain extent. If the harmony of these muscles is disturbed from some cause or another, or if the ligamentous support is weakened, other points of fixation must necessarily yield. Any cause which disturbs the general muscular ligamentous tone must necessarily disturb the stability and consequently weaken the main support between the trunk and the lower extremities. Doctors Lovett and Reynolds in a paper published in 1909, state that the center of gravity of the body is not at the hip joint but somewhat above, and from this we may suppose that it

is probably somewhere between these opposing groups of muscles dividing the trunk and the lower extremities. The erector spinæ muscles emanate along the dorsum of the trunk and are inserted into the sacrum with only a few fibers attached to the ilia. Doctor Albee has shown that in trying to separate the sacrum from the ilia the ligamentous structures of the latter give way more readily than those of the former. This teaches us that the sacrolumbar joint is well protected, and that the sacro-iliac joint is a weaker joint and comparatively unprotected in proportion to the amount of work placed upon it and its function. The posterior trunk muscles act as a protection to the physiological curve of the lumbar spine, but as soon as there is any anatomical disarrangement, as for instance, an increased lordosis, they force undue pressure upon the lumbar spine and tilt the upper portion of the sacrum forward, thereby straining the sacro-iliac joint. Singularly enough the symphysis pubis plays little part in the stability of the pelvic girdle. When motion exists there it may be in any direction, but is usually lateral. In certain physiological conditions, as in pregnancy, distinct change of contour takes place in the pelvic girdle. Considering the mechanism of labor we note that the diameters of the superior and inferior straits are materially changed by the forward and backward movement of the sacrum.

One of the chief factors causing a relaxation of the pelvic girdle is passive congestion. This is demonstrated in pregnancy and to a lesser degree during menstruation. When the tone of the pelvic ligaments is normal the sacro-iliac joints are capable of much strain, but as soon as the pelvic ligaments relax either from disease or from some physiological process, the joints very easily yield to strain. This may be caused in many different ways as will be shown below. This sacro-iliac strain may give rise to varied symptoms depending upon its severity and its cause, and also upon the nerves affected by the disarranged anatomical structures. The lumbar and sacral plexuses are closely related to the sacro-iliac joint. In this region there is a dense framework of ganglia and nerves (the sympathetic

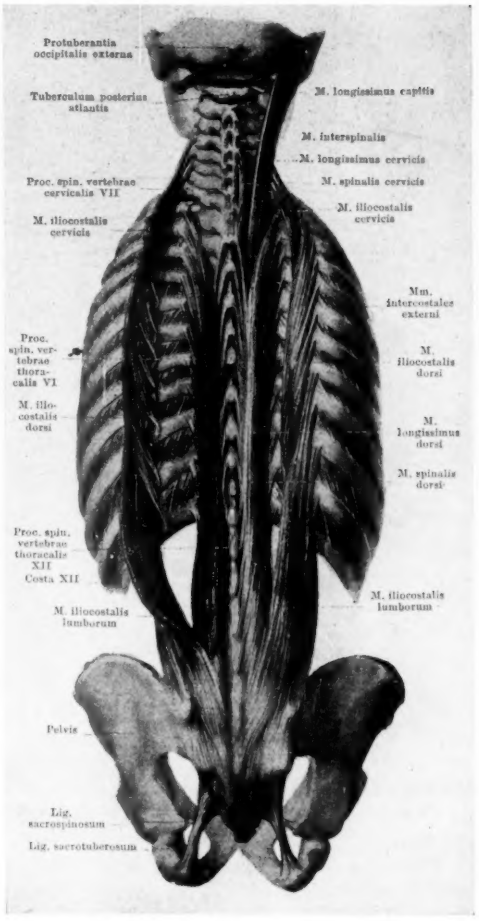


Fig. 2. Showing relation between the pelvic girdle and the upper trunk (His).

system), which are distributed to the various organs of the body. The symptoms produced by any irregularity in the sacro-iliac joints depend upon the pressure of the nerves involved and their distribution.

Normally the body should stand erect with a slight physiological lumbar, dorsal, and cervical curve, but if these curves are influenced in any way we can readily see how easily a strain may be transferred to the sacrum. The lumbar curve, for instance, may be increased by a heavy pendulous abdomen which con-

Fig. 3. Radiograph of normal sacro-iliac joints. Note that the articular surfaces of the sacrum include but a short portion of the sacrum. The broad irregular line shows the articular cartilage.

tinually drags upon the lumbar spine, throwing the upper portion of the sacrum forward and the lower backward while the patient is upright. As soon as the patient lies down the reverse takes place, the upper portion of the sacrum is thrown back and the lower forward. If this process continues over a long period a loose pelvic girdle may be the consequence.

Individuals with pendulous abdomens are frequently in a state of lipomatosis with very flabby and relaxed ligaments, and a general ptotic condition of the viscera and supporting ligaments exists. This same ptosis may occur in other individuals due to other causes than lipomatosis in which the same result is noted. In pregnancy a heavy abdomen with the physiological congestion is the normal process, and the pelvic girdle is allowed to widen by relaxation of the pelvic ligaments. The same condition, only in a lesser degree, occurs during menstruation, in which acute relaxation of the ligaments occurs, and if at that time any undue strain is brought upon the pelvis chronic relaxation may be the result. Thus in the normal physiology there is a certain relaxation and contractibility of the pelvic girdle. Holding Fig. 2 in mind we can readily see that this same strain of the sacro-iliac joints may be produced whenever the erect position and the normal physiological curve of the lumbar spine are interfered with, as for instance, when the pelvis is tilted sidewise owing to flat foot, a short limb, an ankylosed hip joint, or more frequently faulty attitude, as for instance, an extreme lordosis. Any force which tends to drag the lumbar spine forward or backward will necessarily strain or weaken the sacro-iliac joints. Thus we frequently find in very obese women with heavy abdomens that there is so much weight bearing upon the lumbar spine that backache is complained of, also in heavy males.

In pregnancy this backache is almost constant, the symptoms varying to a greater or less extent, depending upon the position of the patient. The sacro-iliac joint may be injured in many different ways, the strain following a normal process or some pathological condition, as well as by direct or indirect muscular action. That many patients are more comfortable in high heeled shoes is accounted for by the fact that the relations of the ilia and sacrum are brought nearest to the normal.

### TYPES AND CLASSIFICATION OF SACRO-ILIAC RELAXATION

From a careful study of these pelvic joint cases, it was observed that certain groups presenting certain symptoms could also be classified according to their etiology, also that these different groups reacted to different methods of treatment. It is entirely erroneous to believe that every case of sacro-iliac relaxation or strain may be treated in one and the same way. The ultimate success in treating the case depends upon the surgeon's recognizing the underlying cause which has produced the relaxation or strain, also in his ability to differentiate true relaxation and joint strain of the pelvic girdle from other conditions very similar, and that he is not misled by the vague symptoms which are so frequently produced by a relaxed pelvic girdle. The types to be considered herewith are type A — traumatic (primary and secondary), type B — general debility, type C — uterine, and type D — neurotic.

### DEGREE OF JOINT MOTION

Every case of pelvic joint strain or relaxation, presenting definite symptoms both subjective and objective, may not present the same amount of anatomical disarrangement of the sacro-iliac joints. The slightest amount of abnormal motion in these joints may manifest itself in the severest subjective symptoms. A slight forward and backward motion of the sacrum (loose sacrum), may often be detected in the chronic cases. Again a mild subluxation of one or both joints may be present without an actual permanent displacement, but rather a slipping of the articular surfaces. The subluxation may or may not reduce itself, nevertheless the joint and its different

Fig. 4. Open right sacro-iliac joint of case 84. Note the broad light irregular area at the pelvic brim demonstrating a subluxation.

parts are left weak and subject to constant injury. In the severest cases, the joint may actually have become dislocated and may also reduce itself by means of the spinal motion, as for instance, when the injured person attempts to straighten quickly. The dislocation and subluxation of the sacro-iliac joint are practically different from that of the hip and similar joints. It should not be forgotten that the articular surfaces of the sacro-iliac joints are rather flat, broad surfaces, and that the abnormal motion is correspondingly a gliding one. Separation is usually brought about by any motion of the spine or limbs; the separation may exist only when active or passive motion of the trunk or legs is attempted. With these motions the symptoms are most marked.

### COMMON SYMPTOMS

Naturally the symptoms depend upon the severity of the anatomical disturbance, and may vary from the most sharp and lancinating pain so that the patient can scarcely move without screaming, to a very mild, troublesome backache. More frequently we find the intermittent subjective symptoms especially in those types of long standing. It is now beginning to be recognized that almost all of the

sciaticas are due to sacro-iliac relaxation, although we must not lose sight of the fact that there is such a thing as a true sciatica, but when it exists there is an actual inflammation of the sciatic nerve or its sheath. Many of the cases of backache, lumbago, occipital headache, sciatica and the like, may be traced back to the strain of the sacro-iliac joints. In some of the cases complicated by infectious processes, the sacro-iliac joints, like any other joints, may become involved both mechanically and pathologically, and in these cases we frequently find that there is actual swelling or thickness over the area of the joint, and actual infection, the source of which cannot always be traced. This infection may be brought about by actual toxæmia or by constant irritation of the joint by a slight motion of the articular surface of the sacrum. In some cases one joint only is involved, while in others, both joints. It is surprising to see how many of these cases are connected with chronic uterine and pelvic congestion or disease which has not been relieved by gynecological interference, and it is not to be wondered at that many of these latter cases become neurasthenic and semi-invalids when a continual sacro-iliac irritation exists. We must not forget in considering the gynecological aspect of the malady, the close proximity of the inner aspect of the sacro-iliac joints to the pelvic viscera, as for instance, the posterior cul-de-sac, Fallopian tubes, uterus, etc., and that the many affections interfering with these may also directly or indirectly influence the sacro-iliac joints, that is, causing a congestion at first and later a relaxation of the ligaments with a consequent subluxation of the sacro-iliac joints and vice versa; also that the minute network of nerve structures passing through or near the sacrum may give symptoms of hyperæsthesia and anæsthesia which may at first be entirely misleading as to their origin.

The subjective symptoms that may be present are sharp pains depending upon the nerves involved. If pressure is brought upon the sciatic nerve, which passes very close to the sacro-iliac joint, a so-called sciatica may be the result; likewise if the ovarian or uterine branches which emerge from the sacrum are disturbed, symptoms in these organs usually exist and may interfere with their functions. At different times there may be pains in the hypogastric region, and rarely, over the appendix. When the sympathetic system is interfered with, we can readily see that varied functional symptoms may occur. This is frequently the case in the neurotic type.

The objective symptoms are more readily understood and recognized. Walking is interfered with, motion of the spine may be limited, or the patient may be bent forward, unable to assume a straight posture. The characteristic symptom in the acute traumatic condition is the tilting of the pelvis and listing of the patient to one side, usually toward the side of injury. The special symptoms of the different types will be considered below.

### TYPE A. TRAUMATIC

#### *I. Direct Trauma to Normal Sacro-iliac Joints*

Although normally in both the male and the female the pelvic joints are firmly held together, it is surprising to see how frequently and how quickly they become involved either by direct trauma or by indirect muscular action. This class of cases usually presents unilateral lesions but they may also be bilateral. The symptoms and lesions in this class may be severe or mild, depending upon the amount of trauma but not necessarily upon the severity of the cause; thus for instance, a person may make a quick motion, as jumping out of an automobile, and thereby setting the opposing groups of muscles into play, and a quick snap or kink in the back be felt with a consequent unilateral sacro-iliac displacement. Likewise, one may bend forward in the act of lifting a heavy object and suddenly feel a snap in the lower part of the back accompanied by a sharp pain. Upon straightening, the pain may be referred down the limbs or up the back. The sacro-iliac joint has received the entire force of the effort, and the bony surfaces of the sacrum and ilia have slipped. The snap which is frequently heard appears to come from the lower part of the spine or the hip, but in reality is from the sacro-iliac joint. A sudden twist of the trunk upon the pelvis, as in jumping from a car, a sudden

stumble or fall upon the sidewalk, a fall from some height, or sitting down quickly, may produce a simple strain of the sacro-iliac joint and actual displacement, or a rupture of some of the ligaments with displacement. The symptoms may recur at intervals.

Other etiological factors placing the case into this group are those following strain produced upon the operating table when the lumbar spine is allowed to become obliterated either due to complete relaxation and strain produced by the patient's position on the table under a prolonged anæsthetic, or by strain produced by the procedures of the surgeon or attendants, as for instance, in manipulating or in moving the patient. The milder form, which is so frequently noted in our hospitals, is chronic backache, which is complained of by the patients after being in a recumbent position for some time, its severity depending upon the softness of the bed and the general physical condition of the patient. Cross country automobiling is a frequent factor in this condition, as is also prolonged riding upon a railroad train. Deformity of the hip or a short limb, causing the patient to walk under strain, frequently produces traumatic, recurrent sacro-iliac strain; likewise faulty attitude, as for instance, an exaggerated lordosis, in which all motions of the spine are restricted, so that the bulk of the spinal compensation is referred down to the sacro-iliac joints, causing the sacrum to tilt forward, and also in severe deformity of the back, as in extreme cases of Potts' disease.

### *II. Direct Trauma to Sacro-iliac Joints following Polyarthritis*

From the above we note that the normal sacro-iliac joint is easily subjected to trauma in many different ways as above enumerated, and it is not to be wondered at that in diseases in which the lumbar and pelvic ligaments have either become hardened and are less elastic, or in which they have become fixed by adhesions to adjacent structures, they may be more easily injured so that the sacro-iliac joint is already weakened. In osteoarthritis the ligaments are usually less elastic, and actual hypertrophy of the cartilage and ligaments exists, and when these structures are injured in any way they do not as readily regain their former conditions. Also, in those individuals affected by osteoarthritis and the like, a chronic sacro-iliac strain may arise from the slightest joint strain in the pelvic region. When a strain occurs there is frequently greater pressure upon the surrounding nerve tissue and the symptoms may be referred far from the seat of injury. The same is true of infectious arthritis. In these cases the joint itself may be involved by the same process of infection involving other joints, and the entire spine become rigid. When the entire spine is rigid, the spinal segments do not compensate, so that the entire spinal motion of the individual in his daily movements is referred to the sacro-iliac joint, as for instance, Fig. 7. In tuberculosis, infectious arthritis and the like, the same conditions must be recognized.

#### TYPE B. SACRO-ILIAC RELAXATION DUE TO GENERAL DEBILITY

In this type have been placed the cases of sacro-iliac strain which occur secondarily, whether due to typhoid, specific, cardiac, lipomatosis, or a general run down condition caused by many of the intercurrent diseases. In typhoid and the like the patient is committed to bed for a long time, and if care is not taken a chronic backache soon is noted due to obliteration of the lumbar spine after a weakening of the structures from the disease has taken place. The symptoms may occur during the illness or some time after the patient begins to walk. The pelvic girdle has become relaxed allowing the sacrum to move to and fro sufficiently to cause irritation. It might be more correctly termed a "loose sacrum." In many of these cases it is possible by taking a careful history to trace the beginning of the backache to some former illness which has had great debilitating effects. These cases usually present bilateral lesions of the sacro-iliac joint. The symptoms are a constant or general weakness in walking, and a tired feeling while standing. They usually present a flat back, which indicates that the process has been going on for some time with exacerbations at intervals. Usually these patients cannot lie comfortably on their back but sleep better on their sides with the thighs

flexed. This is due to the fact that with the thighs flexed, the hamstrings are relaxed with consequently less strain on the pelvis. When faulty attitude is concurrent with general debility whatever the cause may be, the symptoms are more pronounced.

We must recognize that the continual irritation of the sacro-iliac joint from a relaxed pelvic girdle may induce a chronic irritation, which in turn may be infected by the intestinal toxæmia which frequently accompanies the above maladies. The intestinal and other toxins may affect the sacro-iliac joint as they do other joints, leaving a thick, irritated, painful, and swollen joint which is aggravated by walking, sitting, or any undue strain on the pelvic girdle. When this is the case the patient complains of a burning sensation in the lower part of the back, and will every time place the hand directly on the sacro-iliac joint when questioned in regard to the location of the pain. The patient also complains of backache, pain in the small of the back or pain in the hips. This pain is usually referred from the lumbar or sacral plexus, and when occurring in the female may give rise to menstrual disorders, as for instance, dysmenorrhœa. It has often been noted that after the pelvic girdle was supported the menstrual periods became regular. Very frequently flat foot is seen in this type. Individuals with a general lipomatosis suffer much in the same way. As their weight increases the pelvic joint strain is more pronounced. The cases in this type as a rule do not complain of sharp pain but the pain is referred to different parts of the body. General fatigue while standing is an almost constant symptom.

### TYPE C. SECONDARY TO UTERINE

Remembering the many causes of pelvic congestion which may occur, and that all have a tendency to relax the ligamentous structure and cause a general disturbance, and that the pelvic viscera are closely related to the sacro-iliac joints internally, I have placed in this class only those cases which are due to uterine diseases. These may vary from ordinary menstrual relaxation with a consequent strain on the pelvic joints to the many more serious gynecological conditions, as for instance, pelvic tumor. Recently a paper published by Doctors Lovett and Reynolds showed that the orthopedists and gynecologists have in this class of cases much in common. Many cases of this kind have been referred to me by gynecologists. In other cases gynecological operations have been performed without success, and in some instances the coccyx has been removed, and in others ligaments shortened, without relief. The frequency with which the broad ligaments and round ligaments have to be shortened by gynecological interference is the best example of the yielding of ligaments caused by congestion. It has been suggested by Doctor Goldthwait that sacro-iliac joint strain may cause pelvic congestion, and vice versa.

In the severe types of this class the history of the case frequently dates back to the birth of a child, and in some cases it may be traced to delivery by high forceps. In the chronic cases, especially in those individuals who have had gynecological treatment without relief, we find a more general symptomatology. When the causative factor is a relaxed pelvic girdle due to a difficult labor, an actual displacement of the sacro-iliac joint may occur, giving rise to the same symptoms which are found in the acute traumatic, as for instance, guarded and painful motion while walking, restriction of spinal motions accompanied by sciatica or cramps in the legs. Immediate relief can be given by proper treatment and the symptoms will disappear quickly. In the cases caused by relaxation following menstrual disorders, the symptoms may be intermittent, being chiefly noted at menstruation, from a pain in the abdomen and the small of the back to a severe sciatica which has been observed by the author. Invariably muscular spasms of the lumbar spine are present, forward bending of the trunk is restricted. In some cases, without the leverage of the limbs, by placing the thumbs upon the sacrum and the fingers upon the ilia, motion may be felt in the sacro-iliac joint. In the cases caused by pelvic disease the symptoms are similar to the above, but more constant, and not of the intermittent variety.

By a recognition and tracing of the symptoms it is very frequently noted that the

entire irritation is due to strain of the sacro-iliac joints. It is this class of cases which can, by proper diagnosis and treatment, be rescued from chronic invalidism. We are happy to note that this fact is being recognized more and more by gynecologists, and the nucleus of the situation may best be given by quoting the discussion of Dr. C. C. Frederick in the Journal of the American Medical Association, vol. liii, No. 16, in part as follows:

"Over a long series of years we have all had women come to us, young and old, who have been treated by all the various methods employed for the relief of pain in the back, pain down over the appendix, pain in the ovarian region, tenderness in the pelvis, etc., the pelvic organs being blamed for the pain, discomfort, and neurasthenia. If we go back into the history of these women, we will find a fall or accident to which at the time little attention was paid. Gradually, however, symptoms developed over a number of years and the women have become semi-invalids with neurasthenic symptoms, pain in the pelvis, dysmenorrhœa, and all the ills of women. A pelvic examination in every one of these cases will elicit the greatest amount of hyperæsthesia. The vagina, uterus, tubes, introitus are tender. Every bit of tissue below the brim is tender, presumably due to some intrapelvic condition. The patients have been tamponed and treated and it is almost impossible to convince the attending physician and the patient that the condition is not intrapelvic, but due to trouble in the sacro-iliac joint. This can be easily proved in a certain number of cases by the relief that comes from good hip support and support of the iliac joint. The period of time that elapses and the persistence with which the treatment must be followed up, the slowness of recovery from the injuries done to the tissues about the sacro-iliac joint, and especially to the delicate nerve distribution, make the hope of the patient ofttimes drop below par and cause her to think that a mistake in diagnosis has been made I believe, however, that almost every one of these patients can be cured by the use of the hip bandage, leaving out of the treatment all intrapelvic tinkering and everything addressed to the intrapelvic organs. I have seen women whose ovaries have been removed, who have been curetted and subjected to other operative procedures, and yet the pain has persisted."

The cases of subinvolution after pregnancy and the resulting backache and other symptoms, are familiar to us all. Not until the pelvic girdle has been properly supported can the gynecologist successfully treat the case. Likewise the orthopedist cannot expect success in many of the cases in this class unless the gynecologist is consulted, and the primary cause also treated.

The conventional abdomen swathe used after labor may do much harm if not properly applied, and may defeat its purpose. Its pressure upon the crests of the ilia may actually separate, instead of coapting, the sacro-iliac joints. A similiar result may be produced by the straight front corset.

### TYPE D. NEUROTIC

By classifying this type as neurotic, I wish it to be clearly understood what I mean by neurotic. I do not mean that the symptoms of the patient are either imagined, exaggerated, or that there is actual nerve inflammation, but I refer to that class of individuals with highstrung nervous temperaments and active life, whose musculature does not easily relax except while they are asleep. This intermittent relaxation may at times cause strain of the sacro-iliac joint, especially when there is a run down condition due to overexercise of mind or body. These cases present a varying degree of symptoms from a slight backache to a sharp sciatica, together with many nervous symptoms which are indefinite in their origin. This can probably be explained by the fact that the sympathetic system is very dense in the lumbar and sacral region. Hyperæsthesia and anæsthesia are frequently noted. Many times this hyperæsthesia is referred to the lower part of the sacrum and coccyx.

At first these symptoms, which often take the form of so-called neuritis, indefinite sciatica, or intercostal neuralgia, and the very common occipital neuritis, can, in many instances, be traced to an existing strain of the sacro-iliac joints. In these individuals who are usually otherwise healthy, we may find the posterior back muscles in a state of spasm, the spasm being referred high up to the occiput. We may also find in these cases a slightly tilted pelvis with a relatively shortened limb. Muscu ar spasms in the lumbar region may occur in many of the types, especially the acute traumatic, but the spasms in this class are entirely different and generally

much higher up the back than those produced by acute trauma. In this class of cases we less frequently find a flat back but the opposite, a lordosis with a forward tilt of the pelvis caused by the tensity of the hamstring muscles as well as the psoas and pyriformis groups. These cases present an intermittent strain of one or both of the sacro-iliac joints. This is by far the most difficult class to diagnose as patients frequently present referred symptoms, and one may easily be misled unless the physical examination and diagnosis are made by one accustomed to this type of cases.

CASES ILLUSTRATING THE VARIOUS TYPES

*Case 80, Type A*

History. Mr. ———, 45 years of age, referred to me by Doctor Hartwig, May 17, 1907. Patient had been in active business until nine months previous, at which time he was taken with a sudden sciatica and kink in his back. The patient had previously been in good health but was somewhat run down owing to his active work. The pain in his back and limbs grew steadily worse until he was unable to remain at his occupation. At times the pains were so sharp that he was forced to remain in bed. After resting in bed the pains would somewhat disappear encouraging him to go about again. Over the nine months the pains were intermittent, but grew steadily worse and presented a more constant appearance so that the patient was suffering from loss of sleep. While up, crutches were necessary for locomotion.

Physical examination. Fairly developed and nourished man; color somewhat pale; apathetic facies; pupils react to light and distance; K. J. plus; no clonus; unable to take a step without outward evidence of severe pain; patient stands listed to left side and back shows marked muscular spasms on left side of spine when in standing position; these disappear when patient is on back or face; patient has flat back with reversed lumbar curve and slight prominence of the vertebræ in the lower dorsal spine; active flexion of the spine limited in the lumbar region; left leg relatively shorter than right; both iliac fossæ free; any attempt at rotation of leg produces pain in the lower spine. Hyperæsthesia noted from umbilicus down. Patient in extremely excitable state.

Diagnosis. Chronic sacro-iliac dislocation with acute exacerbation.

Treatment. The patient was prepared for a plaster jacket and both limbs firmly stretched and manipulated with counter pressure on the sacrum. This caused considerable pain to the patient but after the procedure he could rest more comfortably. He was then placed over the Goldthwait irons with extreme hyperextension of his spine and pressure on his sacrum. The plaster jacket was then applied in this position, gripping the pelvis firmly. The patient was suffering such severe pain that he could not walk. It was then thought best to add to the plaster jacket a partially rigid spica reaching well down to the knee on the left leg. The patient was then sent home in an ambulance and ordered to bed. Two days afterward he was able to get up and around. His sciatica disappeared somewhat, and it was noticed that his body was not listed as much as it had been. A week later he was able to walk without a crutch and improved rapidly until the pain entirely disappeared. A month later he was able to run upstairs although still wearing the plaster jacket. The patient felt so well that he did not report to the office until four months later, at which time it was thought best, owing to his weight, to protect the pelvic joints by another but shorter jacket, which was worn for two more months. In the meanwhile the patient was able to return to work and could withstand an entire day's work as formerly. The jacket was gradually removed, a

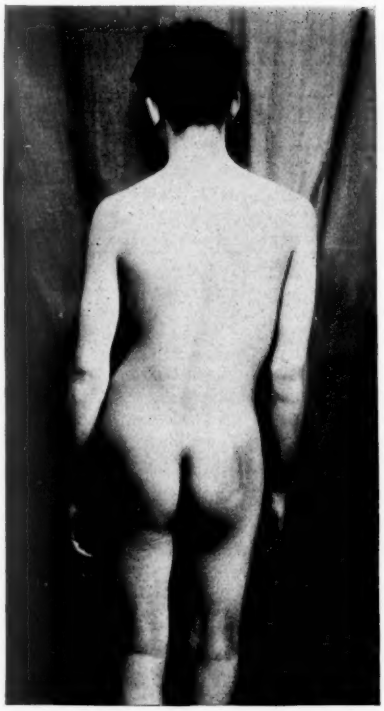

Fig. 5. Acute unilateral sacro-iliac dislocation (traumatic). Note the listing of the body to the right side and the different level of the hips.

Fig. 6. Chronic sacro-iliac relaxation. Note that the back brace is being fitted so as to grasp the pelvis firmly and exert pressure on the sacrum.

light pelvic belt substituted, and the patient discharged.

Discussion. This case illustrates the type of acute injury to the sacro-iliac joint which often occurs in active people, otherwise very healthy but in a general run down condition, due, as in this case, to overwork. The original injury was acute dislocation of the left sacro-iliac joint, w th direct nerve pressure upon the surrounding nerve structures. The relative shortness of the limb was due to the tilting of the pelvis and muscular spasms of the lumbar spine. The sciatica was due to the pressure upon the sciatic nerve. By the manipulative procedure the sacrum was brought into its normal relation to the ilia, and fixed by means of a plaster of Paris jacket. In all probabilities the pelvic ligaments were not torn in this case, but were simply stretched. This case illustrates the type presenting symptoms which are frequently mistaken for sciatica or acute spinal curvature.

*Case 46. Type A*

History. Mr. ———, age 32; referred to me by Doctor Roswell Park, May 5, 1906; occupation, salesman; past history, negative. Two months previous, while jumping off a car, with a heavy typewriter in his hand, the patient suddenly felt a snap in the lower part of his back with a sudden and sharp shooting pain down his left limb.

Physical examination. Fairly developed and nourished man; color good; weighs about 180 pounds; walks with body listed to the left side and bent forward; cannot walk without cane; any active or passive motion of thigh produces sharp pain in his leg; cannot sit down without agony; blood count normal.

Diagnosis. Acute traumatic sacro-iliac dislocation.

Treatment. Case was sent to the hospital and a plaster jacket and spica applied in the hyperextended position. The patient was kept in bed in a recumbent position. Two weeks after the first jacket was applied the patient was able to lie flat on his back comfortably, but as soon as he turned on either side pain would occur. After two more weeks this disappeared, and it was attempted to have the patient stand, but standing or walking brought on exacerbation and no further attempts were made until a few days before his discharge. The patient remained in the hospital six weeks, during which time the jacket had been changed owing to loss of weight. At the end of this time a removable jacket was applied and the patient allowed to go home. This was gradually omitted, and he was able to resume work without any further symptoms. A year later he reported that he was engaged in active business.

Discussion. This case presented one of acute dislocation with actual rupture of some of the supporting pelvic ligaments. The case is one of pure traumatic origin without any infection of the joint proper but mechanically displaced. Its slow reaction to treatment was due to the rupture of the ligaments and their union. The X-ray showed no fracture of the pelvic bones.

*Case 43. Type A*

History. Dr. ———, referred to me by Doctor Rochester, August, 1906; a physician; had been leading an active practice; always well until a few months previous when, while riding in an elevator, the elevator severed from its moorings and descended ten or fifteen feet, injuring some of the other

Fig. 7. Sacro-iliac strain secondary to infectious arthritis with rigid spine. Note the flat and stiff back. All motions of the trunk are referred to the sacro-iliac joint.

occupants in the car. Ever since the accident the patient had noticed sharp pain in the small of his back which caught whenever active or passive motion of the spine or legs was attempted. Also, there was local tenderness in the lower part of the spine and in the abdomen. The pain in the small of his back and abdomen grew continually worse, so that the patient had to remain on a couch and give up his active practice.

Physical examination. Fairly developed and nourished man; moderate weight; pupils react normally; K. J. somewhat plus; walks guardedly with slightly flexed spine; heart and lungs not examined; abdomen sensitive to deep palpation especially in hypogastric region; liver dullness normal; abdomen tympanitic; pressure on both crests of ilia gives rise to pain in small of back; rotation of limbs very painful. X-ray showed no fracture of the pelvis or spine.

Diagnosis. Acute traumatic sacro-iliac dislocation.

Treatment. The patient's limb was forcibly stretched with counter pressure upon the sacrum and a plaster jacket applied while in a recumbent position, without an anæsthetic. Patient was sent home. Twelve hours later the abdomen became distended and the cast grew uncomfortable, so that a large window had to be cut in the jacket. In the following month the abdominal symptoms slowly disappeared and the patient was able to get about. The casts were changed at intervals of months, and finally a light webbing support was applied, holding the pelvic girdle in place. Apparatus was worn until the following year when all of the symptoms had disappeared. The patient was able to engage actively in his practice.

Discussion. This case presents the severest type of one of the most acute forms under Type A. The sacrum in this case was undoubtedly jammed in between the pelvic bones, causing actual rupture of the supporting structures of the sacro-iliac synchondrosis on both sides. During the convalescence of the case, there were many nervous symptoms constantly presenting themselves, which made the case somewhat difficult to treat by mechanical means. Visceral ptosis also existed in this case but it was not the paramount cause of the symptoms.

*Case 52. Type A*

History. Mr.———, referred to me June 16, 1908, by Doctor Charles Stockton. The patient, an engineer, gave the following history: always well with the exception of a few minor ailments until one month previous, at which time he attempted to lift a heavy rail. He felt a sudden snap in the small of his back and was at first unable to straighten up. Slowly he was able to straighten but he noticed that he could not take long steps. Breathing became painful, and as he moved about he felt a sharp sciatica in his right limb. Next morning the symptoms still persisted although less in degree. After that the symptoms were intermittent but grew gradually worse. He at first attributed it to an attack of sciatica but it did not yield to treatment. Doctor Stockton diagnosed the case as sacro-iliac dislocation and referred him to me.

Physical examination. Well developed and nourished man; heavy, walks guardedly; flexion limited, and muscular spasms noted in the lumbar spine; right lateral motions free; left lateral motions restricted; pelvis somewhat tilted; right posterior superior spine higher than left. Hyperextension of the spine with the patient on his face, gave rise to sharp stinging pain over both posterior pelvic joints; pressure on the crests of the ilia produced stinging pain in the region of the sacrum; patient in sitting posture with knees flexed showed flexion of the lumbar spine somewhat more than with the knees extended; as soon as the knees were extended the pain was referred to both thighs and the scrotum.

Diagnosis. Exacerbation of acute traumatic sacro-iliac dislocation.

Treatment. Broad adhesive strapping with felt padding over the sacrum was applied from crest to crest down to the trochanters, after forcible hyperextension of the limbs with counter pressure on the sacrum. The patient reported the next day, saying that he felt better than he had since the accident. The following day, owing to the

fact that the strapping had become loose, a plaster jacket was applied on the Lovett drop hammock. The next day the patient reported that all of the symptoms had disappeared with the exception of some pain in the scrotum. The jackets were changed at intervals, after which time a lighter celluloid jacket was applied with instructions to remove at night. Six months later a light steel corset was applied, for which later a webbing belt was substituted. The patient was thereupon placed upon high heeled shoes and plates so as to change the equilibrium and balance of his body. He was advised to wear the pelvic belt at such times as he should be unusually active, so as to prevent acute pelvic strain.

Discussion. The pelvic strain and symptoms in this case were produced by the actual slipping of the sacro-iliac synchondrosis. As the patient straightened the sacrum probably slipped back of its own accord, and the further symptoms were caused by a weakened joint in a heavy man, rendering the pelvic girdle unstaple. Chronic irritation was probably established as he walked about, producing muscular spasms in the lumbar spine and pressure on the sacral plexus.

*Case 39. Type A*

History. Mr. ———, referred to me by Doctor Henry Bentz, July 24, 1909; a carriage trimmer; in good health; weighs 175 pounds; was taken by sudden cramps in the small of his back while lifting an automobile body. From that time on he was unable to do his work and thought that he had "rheumatism with curvature of the spine." The condition grew worse and he was unable to rest at night. He found that he could sleep more comfortably on his side with the thighs flexed, but as soon as he attempted to roll over the pains were severe. He then consulted his family physician, who referred him to me. He had one attack similar to this three months previous but not as severe.

Physical examination. Well developed and nourished man; with heavy and pendulous abdomen; listed to the left side with sharp left lumbar curve; patient walks with a waddling gait; forward flexion of the lumbar spine was limited, and marked muscular contraction noted; the contour of the back was flat; lateral motion on the left was freer than on the right; K. J. normal; in a sitting posture with knees flexed, the lumbar spine admitted some flexion, but with the knees extended, spasms and restriction of motion were noted; the pelvis was tilted so that its right posterior superior spine was higher than the left; deep palpation over the sacro-iliac joints gave rise to pain.

Diagnosis. Acute exacerbation of a chronic sacro-iliac dislocation.

Treatment. Under complete anæsthesia with the patient on his abdomen and with leg at right angles, the thigh was forcibly abducted and then hyperextended, at the same time pressure being forcibly exerted upon the sacrum. At this period of the manipulation a sudden sharp snap was heard. With broad adhesive strapping the sacrum and ilia were held in place. A heavy flannel spica was then applied and the patient allowed to walk home. The next day a plaster jacket was applied and the patient placed in bed. The next few days the symptoms were somewhat exaggerated, and the peristalsis ceased entirely. The abdomen became bloated and a window was cut into the cast over the abdomen. At this time the patient was suffering considerable pain over the sacro-iliac joint. By massage and deep kneading, after twenty-four hours intestinal movement was again established. One week later the patient was up on his feet, and it was noted that the listing of the body had almost entirely disappeared. After another week the patient was able to get around, and the third week went back to work, still wearing a plaster jacket.

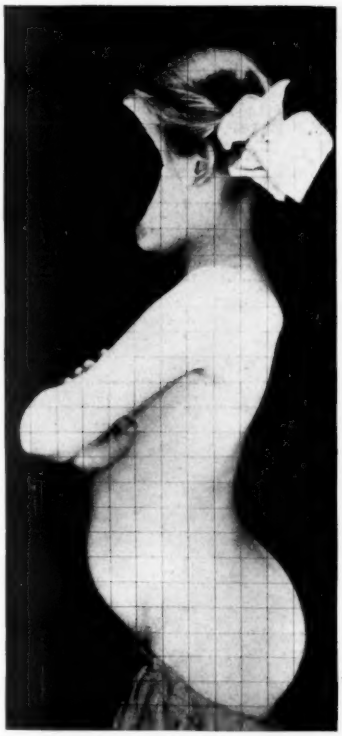

Fig. 8. Sacro-iliac joint strain due to faulty attitude in a child. Note that all the weight of the superimposed body tends to drag the sacrum forward. Symptoms of visceral ptoses were also present in this case. They subsided after faulty attitude had been corrected.

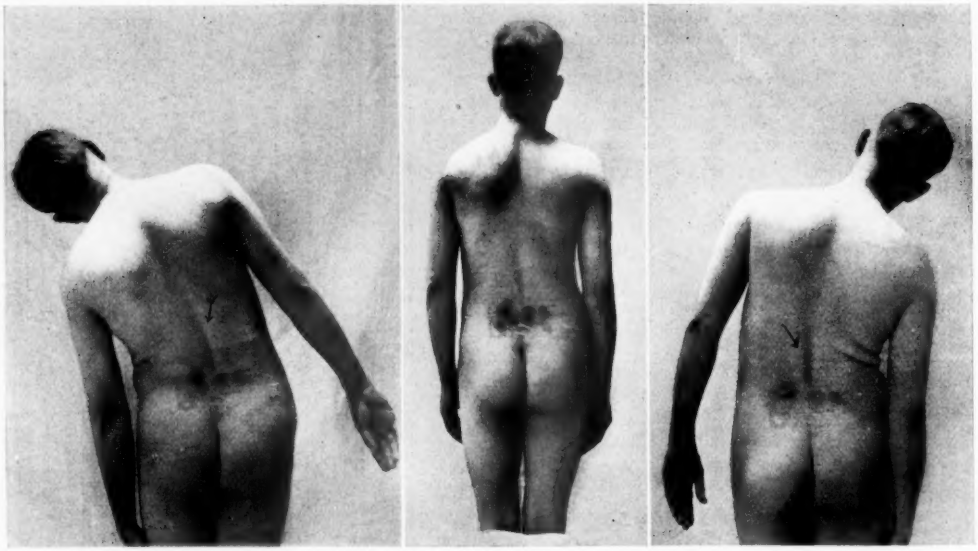

Fig. 9. Acute sacro-iliac dislocation. Note the listing of the body toward the left and the prominence of the right hip. Motion toward the left fairly free. Note the restriction of motion to the right and limitation of spinal motion in the lumbar region.

Discussion. The sacrum had probably been under constant strain, due to the pendulous abdomen causing forward dragging upon the lumbar spine and the upper portion of the sacrum. At night complete relaxation resulted, and opposing forces were brought to bear upon the sacrum and lumbar spine, thus obliterating the latter. The last injury caused an already weak sacro-iliac joint to become entirely dislocated. The patient's ability to sleep with more comfort with the limbs flexed was due to the fact that in this position the tension of the hamstrings was relieved, thus decreasing the strain of the sacro-iliac joint. The snap heard at the manipulation was at first thought to be a rupture of some of the ligaments in the lumbar spine, but later on it proved to be the replacing of the articular surfaces of the right sacro-iliac joint. The case is somewhat unusual, owing to the fact that the listing of the trunk was away from the sacro-iliac joint rather than toward it.

*Case 54. Type B*

History. Mrs.—, referred to me by Doctor Herman Hayd, February 25, 1908; a married woman, 29 years of age. From childhood the patient has had round shoulders and a narrow chest. Had always been considered a weak child. For many years has been distressed with sore throat at intervals. Some years ago had undergone a pelvic operation from which she had completely recovered. Three years ago the patient strained her back by a fall. The last eighteen months she has been nervously exhausted and unable to do her housework. Ever since her accident she has had pain in the sacral region which she attributed to her weak back. Recently she has been under considerable mental anxiety.

Physical examination. Poorly developed and nourished woman; muscles flabby; very nervous; stands with faulty attitude, shoulders drooping forward; both angles of the scapulæ prominent; physiological curve of both the lumbar and dorsal spine increased; motion of spine entirely restricted; slight muscular spasms present along both sides of the spine; no tenderness upon deep palpation of spinal area; slight lateral curvature of the spine present; general glandular enlargement in groin and cervical region; epitrochlear glands not palpable; abdomen soft; pressure on both crests gives rise to pain in small of back; rotation of limbs gives subjective symptoms in sacro-iliac joints.

Diagnosis. Movable sacrum following general debility and faulty attitude.

Treatment. The patient was immediately fitted to a flexible steel back brace so constructed as to hold the pelvis firmly, with pressure upon the sa-

crum. The uprights of the brace extended from the sacrum to the shoulders and were so arranged as to correct the faulty attitude. Instructions were also given as to general hygiene and deep breathing. The patient received immediate relief. A letter received from her one month later stated that her back felt stronger, and that she was gaining in health and strength.

Discussion. This case illustrates a pelvic relaxation in which the spinal joints had been held rigid due to ligamentous contracture in a faulty attitude. Thus the spinal motions have been concentrated at the sacro-iliac joints, instead of being distributed along the entire spine. The general muscular tone having been lowered as a result of suboxygenation or toxæmia, the sacro-iliac joints were not able to withstand the strain and soon admitted more than normal motion with many varied symptoms as the result. The supporting of the pelvic girdle was all that was necessary in this case and afforded the immediate relief.

*Case 3. Type B*

History. Mrs.—, aged 28, consulted me March 3, 1909. For the last few years she has felt generally run down although able to do her housework with effort. Has had typhoid fever and pleurisy. Has always had weak and inflamed eyes which are worse when she becomes tired. About nine months ago, while lifting her child, she felt a sudden sharp pain in the lower part of her back. This passed away after a day or so, and she attributed it to the general backache which she has had for some years. Since that time any stooping motion, particularly when the legs were straight, produced a strain across her hips. Has been troubled with intestinal diarrhœa.

Physical examination. Poorly developed and nourished woman; small and slight in stature; muscles flabby and some loss of subcutaneous fat; temperature 101°; stands with a marked lordosis and round shoulders; spine flexible when patient is in sitting posture; Goldthwait sign present; in standing posture lumbar flexion diminished; lateral motions free; internal and external rotation of legs with knees at right angles causes sensitiveness over the sacral region; deep palpation over both sacro-iliac joints elicits tenderness and swelling; K. J. normal; hyperextension of hips free; abdomen negative; no leucocytosis present.

Diagnosis. Movable sacrum due to general debility.

Treatment. A plaster jacket was applied incorporating a heavy felt pad over the sacrum, the sacrum having first been manipulated. Two months later a removable celluloid jacket was applied. After wearing this five months pains in the upper dorsal spine and in the arms, with intercostal neuralgia, appeared. The jacket was therefore discontinued, and a light spring steel back brace applied, holding the shoulders well back. Strychnia and intestinal medication were prescribed by her family physician. The patient gained steadily in weight and general tone, all symptoms disappearing.

Fig. 10. Osgood brace applied to corsets in the convalescent stage of sacro-iliac relaxation.

Discussion. This case is of the type which is frequently found in young married women who are in a poor state of health. These cases can readily be distinguished from those of the ordinary weak back by a thorough physical examination. The temperature was at first thought to indicate a beginning tuberculosis of the spine, but its flexibility, together with the diffused pains and no leucocytosis, contradicted it. The rapidity with which the patient gained weight as soon as support was given her pelvic girdle, also confirmed the diagnosis. The pain in the arms and intercostal neuralgia were due to

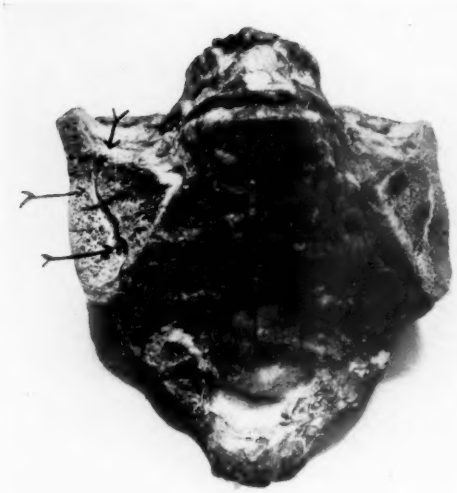

Fig. 11. Specimen obtained at autopsy of case 84. Note the right sacro-iliac joint. The sacrum has apparently dropped downward. Also note the gap of the sacrolumbar joint.

Fig. 12. Same specimen as Fig. 11. Note the forward tilt of the sacrum; any weight placed upon the spine would tend to increase this. The sacrum is swung by the ligaments. Note also that any body weight tends to strain the sacro-iliac joint.

the forward drooping of the shoulders, and disappeared as soon as the shoulders were supported in the correct position.

*Case 84. Type B*

History. Mrs.—, 32 years old, referred to me by Doctor Walsh. Has had phthisis of the right lung which has been pronounced in the quiescent stage. Fifteen months ago she gave birth to the last child, the one previous, three years old, being affected with a spastic hemiplegia due to Little's disease. Ever since the birth of her last child she has had severe pain in her upper dorsal spine and down her limbs. The last few months these pains have grown severe and lancinating in character so that she can with difficulty move about.

Physical examination. Poorly developed and nourished woman; cachectic, with apathetic facies and slight flush of cheeks; running intermittent temperature; walks with short steps; white count 13,000; all motions of the spine restricted; any attempt at passive flexion elicits sharp pain down the right limb as well as through the chest and back; palpation of the lumbar spine gives rise to pain in a localized area involving the 3d, 4th, and 5th vertebræ; abdomen soft; promontory of the sacrum easily palpated through the abdomen; on both sides of the lumbar spine nodules can be distinctly felt upon deep palpation of the abdomen; by placing one finger upon the sacrum and the other finger upon the posterior superior spine distinct motion without crepitation can be felt in the right sacro-iliac joint. The X-ray showed an open right sacro-iliac joint and lesion of the lumbar spine. (See Fig. 4.)

Diagnosis. Relaxed sacro-iliac joint due to general debility caused by tuberculosis of the retroperitoneal lymph glands.

Treatment. Owing to the severity of the symptoms, the patient was immediately put up in a plaster dressing and is able to get about fairly comfortably. She is still under treatment.

Discussion. This case has been cited to illustrate the severest type of sacro-iliac joint strain due to general debility. Before her last pregnancy the pelvic joints were undoubtedly already weak, and the additional strain of pregnancy followed by labor in a woman already suffering from disease, rendered them wholly unfit to support the trunk.

*Case 12. Type B*

History. Mrs.—, referred to me March 8, 1906; a married woman, age 38; for the last ten years has suffered with a dull ache in the small of her back while doing her housework; has always had a weak back since a young girl; the discomfort in her back

constant but noticed more during her menstrual periods. At night she is unable to sleep on her back but is more comfortable on her side with the knees flexed. Patient has never had children, and has been a chronic sufferer from various uterine diseases. She has been treated for pelvic congestion.

Physical examination. Poorly developed and nourished woman; color pale; muscles flabby; stands with both feet flat in posterior arch, but spine in good alignment; contour of back flat; forward flexion of spine somewhat limited; lateral motions of spine free; anterior superior spines level; extreme rotation of both legs with the patient in the sitting posture gives rise to pain in the back; with the patient prone on the table pressure on both crests gives rise to referred pain in the region of the sacro-iliac synchondrosis.

Diagnosis. Relaxation of the pelvic girdle with chronic sacro-iliac strain.

Treatment. The patient was placed in a fixation jacket which gave almost immediate relief. After the patient had worn the jacket for six weeks, the original symptoms began to return. A new jacket was then applied and the patient was able to get around comfortably. After two months' time a removable jacket was applied to be worn only in the day time, and the patient instructed to sleep with a pillow under the small of her back at night. This jacket was worn for six months more and then a spring brace was substituted, so constructed as to bring pressure upon the sacrum and at the same time holding both iliac bones firmly in place. About seven months later the patient reported that she was unable to get along without the brace as it gave her much comfort. She had at times tried to go without the brace but her back had ached in consequence. During this time her general health had steadily improved, and she had become stronger. She was then advised to wear the brace at intervals until she could do without it entirely. Plates and Thomas heels were worn to control the flat foot. At the last report two years later, the patient was feeling strong and able to move about without the brace, and her menstrual periods had become regular in time and amount.

Discussion. This case illustrates the type in which there had been a strain upon the sacrum probably from early childhood. The pelvic congestion was undoubtedly caused by the continual strain of the sacro-iliac joints together with her increase in weight and social activities as she grew older. The first jacket applied held the sacro-iliac joints firmly in place, but as it became looser it did not support the sacrum as before and the symptoms returned. Her increase in weight and strength was due to the fact that the cause of the congestion had been removed and there was less strain on the nerves in the lumbar and sacral region.

*Case 68. Type C*

History. Mrs.—, aged 25, was seen by me April, 1908; a young married woman, having recently given birth to a child which had been delivered by high forceps. Shortly after the birth of the child septicemia had set in which rendered her right hip painful. The condition was rapidly progressive until any motion of the patient caused a severe sciatica, and the patient was rapidly sinking.

Physical examination. Poorly developed and nourished woman; color sallow; pulse rapid; running a temperature; lying in bed with both limbs flexed, propped up by pillows; at the slightest movement of the right leg, patient shrieked; distinct crepitation felt over the right sacro-iliac joint and symphysis pubis; further examination was not attempted and an anæsthetic given.

Diagnosis. Complete sacro-iliac dislocation following a difficult labor, with separating of the symphysis and infection.

Treatment. Patient was placed upon the table, under ether, and the right limb rotated. At the same time the sacro-iliac joints were palpated, as was the symphysis pubis. A distinct grating sensation was felt over both. It was also observed that the right os innominatum played loosely upon the rest of the pelvis. A vaginal examination was then made to determine the true condition of the anterior pelvic joint (the symphysis pubis). It was found that there was an extended fracture completely severing both pubic bones, and that septic sinuses led into the vagina. Through these the loose sequestra were removed. At this stage the pulse and respiration of the patient were rapidly rising. It was therefore necessary to fix the pelvis as quickly as possible and combat the septicemia. The patient was quickly placed upon the portable Goldthwait iron and a double plaster-of-Paris spica reaching well up into the axillæ applied, and she was then treated for shock and septicemia. The patient was then turned over to the family physician who reported a week later that the patient was resting comfortably and that the pain had been relieved.

Discussion. This case represents an exaggerated condition which occurs in normal labor. The sepsis and the subinvolution of the surrounding structures increased the relaxation of the pelvic girdle. The fracture of the symphysis played little part in the symptomatology and stability of the pelvic girdle (there are cases on record in which the patient has had entire separation of the symphysis and was still able to get about. The symphysis pubis is not essential to the stability of

the sacro-iliac joints, but when separation occurs, it renders them more liable to dislocation or strain). In this case the infection had also involved the hip joint. The sacro-iliac ligaments were probably not ruptured or torn, but were simply stretched to such an extent that they allowed the sacrum to slip out of place, bringing about irritation and undue pressure upon the surrounding nerves, especially the sciatic.

*Case 50. Type C*

History. Miss —, 30 years old, referred to me by Doctor Leo Wolf, April 18, 1908. She had always been well until eight years ago when she was taken with influenza from which she made a complete recovery. Ever since two years ago she has had an ache in the small of her back and pain down the left thigh, these being noted whenever a quick movement of the trunk was made or on attempting to sit in a low chair, and in any act of lifting. Sometimes the pain in the thigh was very sharp, at other times dull in character. The severity of the attacks was greatest during the menstrual periods, at which times she could not get about without limping. The mother noticed that her daughter was growing less active and taking on considerable weight. The patient could sleep more comfortably on her side with the knees flexed, and could not take any other position without loss of sleep. She had been treated for sciatic rheumatism for over a year. The patient had been wearing straight front corsets of the extreme type.

Physical examination. Well developed and nourished woman; color good; tall; large hips; stands with exaggerated physiological lumbar curve; pelvis tilted forward; lateral flexion of spine free; forward flexion limited when patient bends with knees straight; patient flat on back causes increased lordosis of spine; pressure on crests of the ilia causes no subjective symptoms; passive rotating of the left thigh gives rise to slight click which could be readily heard. No tenderness over sciatic nerves to deep palpation.

Diagnosis. Question of relaxed pelvic girdle.

Treatment. Patient was placed upon high walking heels and an Osgood brace applied. One month later the brace was omitted entirely, and a webbing belt attached to the lower part of the corset coming well down to the trochanters and forward to support the abdomen substituted. The patient was instructed to sleep with a pillow under the small of the back. The sciatica entirely disappeared. As there were no contraindications, her weight was then reduced by means of a diet and graduated exercises until her normal weight was reached. At the last report the patient was able to go about with complete ease and comfort, and felt better than she had for many years.

Discussion. In this case an absolute diagnosis could not be made without the therapeutics, the symptoms occurring in a young woman otherwise in perfect health and no physical signs either of bone rheumatism or inflammation of the sciatic nerve. She had received thorough treatment for both of these without relief. The increase of symptoms during the menstrual periods when there is a physiological congestion involving all the pelvic supports, and when the body assumed any position that would strain the pelvic joints, and also the immediate relief given by supporting the pelvic girdle, pointed strongly toward sacro-iliac relaxation. The patient had been wearing straight front corsets which pressed upon the crest of the ilia, thereby holding them apart and causing referred strain.

*Case 60. Type D*

History. Mrs. —, a married woman, aged 38, consulted me March 14, 1908; eleven years ago had had typhoid fever, six years ago peritonitis. Since then she has had some eye strain for which she is wearing glasses. A year ago in November the patient had at intervals a slow dull ache in the back, and at times sciatica in the right limb, which was noticed all the way down to the ankle. This had been growing steadily worse so that the patient was becoming worn out owing to loss of sleep. She was unable to attend to her social duties. The patient noticed that she was unable to sit down upon any chair without a tenderness at the tip of the spine, and upon rising from a sitting posture a sharp pain in her right hip occurred. This pain was not constant but would disappear and return. She complained of numbness in both limbs at times. Lately she had been unable to take care of her children, and was becoming very nervous and irritable.

Physical examination. Well developed and nourished woman; tall and well muscled; color good; highly strung temperament; prominent hips and pronounced lordosis; flexion of lumbar spine entirely limited; muscular spasms noted on both sides of lumbar spine; lateral motions of spine free; hyperextension of both limbs limited; marked muscular spasms above sacral region so that flexion with knees straight causes some pain; rotation of left limb gives pain in right hip; a slight fullness visible over right iliac synchondrosis; pressure on both crests gives rise to no referred pain; a slight swelling noted on deep palpation of both sacro-iliac joints.

Diagnosis. Sacro-iliac joint strain.

Treatment. The patient was firmly strapped with adhesive strapping coming well down to the end of the sacrum. This procedure gave immediate relief for the next twenty-four hours, after which

time some of the symptoms returned. It was then noted that the strapping had worked itself loose and was ceasing to hold the pelvis firmly. The patient was then put into a plaster support and all drugs discontinued. At first the patient was unable to tolerate the cast, but soon became accustomed to it as it afforded relief. For some months she had been in the habit of taking sleeping powders and other nerve sedatives, but found that she could now obtain her sleep without them. After wearing the cast for six weeks she again became uncomfortable. It was found that the plaster dressing had lost its grip upon the pelvis. Owing to the sharp contour of the back and the prominence of the hips, the patient was placed in a webbing corset reinforced by heavy steels molded in such a way as to bring pressure to bear upon the sacrum below the crests of the ilia. She was instructed to remove this at night and place under her back a canvas firmly filled with oakum. She was then given over to a masseuse for general massage.

Discussion. This case belongs to the neurotic class, the strain of the pelvic girdle being chiefly brought about by intense muscular strain due to a general psychasthenia. The forward tilt of the sacrum while the patient is up and about under tension in an otherwise very healthy woman, must be differentiated from the same condition occurring in a person with general debility caused by disease. These cases as a rule have difficulty in relaxing the muscles except during sleep when a total relaxation occurs. There is an alternate relaxation and tension on the sacro-iliac joints which, if continued over a long period, bring about an actual irritation of the joint. In this case the slight swelling and thickness over the posterior pelvic joints was due to this irritation. These cases are frequently diagnosed as neuritis but do not yield to its treatment. The symptoms may be vague, depending upon the nerves involved. Drugs, if given in this class of cases, give little relief and may do much harm.

*Case 11. Type D*

History. Miss —, 40 years old; vocal teacher; referred to me by Doctor Moseley, October 26, 1908. Five years ago the patient fell upon an icy sidewalk. Since that time she has noticed a pain in the left side of her neck and left shoulder with constant occipital headaches. The neck symptoms were the most troublesome at the time of menstruation, at which time it was necessary for her to remain in bed for five or six days, giving up her teaching. Her menstrual periods were profuse, and she habitually called in her physician on account of her suffering.

Physical examination. Fairly developed and nourished woman; color somewhat pale and lipomatous; very nervous temperament; stands erect with flat back; pupils react to light and distance; K. J. plus; no chronic joint disease present; forward flexion of the entire spine limited and in a state of muscular spasms; spine sensitive to palpation; passive motion of the limbs normal.

Diagnosis. Movable sacrum.

Treatment. The treatment consisted chiefly in supporting the pelvic girdle by a webbing band applied to the corset, and a light spinal support. Adhesive strappings were first applied but had to be discontinued, owing to the irritation of the skin which they caused. A Thomas collar was also applied but gave no relief. The corset was so modified that the lateral halves were held firmly in place and no independent motion allowed, thus giving new stability to the pelvic girdle.

Discussion. The interesting point in this case is that the symptoms were far remote from the seat of the lesion. The neck and shoulders symptoms were caused by the referred muscular spasms radiating from the sacrum. The occipital headaches were due to the same cause.

*Case 84. Pathological Findings at Autopsy*

Since the paper has been written the patient (case 84) has died of general tuberculosis. It was my good fortune to be able to make an autopsy in regard to the pelvic joints and lumbar spine. The post-mortem examination was made eighteen hours after death and the findings were as follows: The retro-peritoneal lymph glands were a caseous mass which involved the lumbar spine, but chiefly the body of the first lumbar vertebra. Two ivory spikes 6 cm. long were then driven into the sacrum and two into the posterior superior spines of the ilia in a straight line. Manipulation of the limbs was then attempted with pressure upon the sacrum and likewise with pressure upon the crests. There was some motion noted but not marked. A saw was then applied through the ilia and partially through the sacro-iliac joints, removing the lumbar spine and sacrum with part of the os innominata in situ.

Description of specimen (Figure 11). The sacrum was observed to be tilted forward so that the posterior spines were unduly prominent and the fifth lumbar vertebra was sunk forward corresponding to the upper portion of the sacrum, the entire picture suggesting a process of long duration. Many fibrous adhesions were noted on both sacro-iliac joints. The posterior ligaments supporting the sacro-iliac joints were quite hard, probably due to the rigor mortis. The capsules of the joints when palpated from the posterior aspect seemed to fluctuate slightly, suggesting fluid in the joint. This was more marked on the right side. By holding both portions of the os innominata one in each hand and

manipulating, the sacro-iliac joints were observed to move slightly and to emit a fluid at that part of the joint which the saw had exposed. A slight crepitation was distinctly felt in the right joint. After the specimen had been held under warm water for a few minutes there was more motion in the right sacro-iliac joint than previously.

Remarks. The autopsy in this case was especially instructive and was performed with the view of determining the conditions of the retroperitoneal lymph glands, the lumbar spine, and the sacro-iliac joints.

A radiograph (Figure 4) had been taken some eight months before. The patient had been in a plaster jacket until death, so that the pelvic girdle had been firmly held and relaxation was probably less at the time of death than when the radiograph was taken, the latter being taken before the pelvic girdle had been immobolized. Undoubtedly many of the symptoms in this case were due to the involvement of the lumbar spine, the sacro-iliac relaxation being secondary to general debility.

### DIFFERENTIAL DIAGNOSIS

In cases presenting symptoms of lameness, lumbago, sciatica, occipital headache, pain in the small of the back, acute spinal curvature of the lumbar spine, shooting pains down the limbs, neuritis, kink in the back, one should always consider the possibility of a sacro-iliac strain or subluxation. In sacro-iliac cases one or more of the physical signs of pelvic joint strain are always present. In tuberculosis of the spine, lateral motion is usually restricted in both directions. In true sciatica there is an actual inflammation along the course of the sciatic nerve which is more noticeable upon deep palpation. Acute lateral curvature is never caused by sciatica, and when the two exist together they are due to sacro-iliac strain or dislocation. The sciatica which accompanies osteoarthritis of the spine can easily be differentiated from that which is due to the sacro-iliac joint; the sciatica is due to the pressure on the nerves of hypertrophied bone, thereby narrowing the nerve canals. If the osteoarthritis is very far advanced the radiogram will distinctly show this. In actual neuritis and in cases presenting anæsthesia or hyperæsthesia in different parts of the body, the paramount symptoms together with the physical examination will clearly establish a diagnosis. The Goldthwait sign is almost always present in sacro-iliac joint strain, but may also be present in other conditions, as for instance, in early tuberculosis of the spine, but in this last a blood count will assist to differentiate. In the hysterical cases the tilting of the pelvis and an examination under an anæsthetic will help to differentiate.

The so-called spinal sprains are usually unrecognized cases of sacro-iliac strain. However, where the sacrolumbar joint is really wrenched the subjective symptoms may closely simulate those of strain of the sacro-iliac joint. With strain of the sacrolumbar joint the patient can walk guardedly without pain and one does not find the tilting of the pelvis as in sacro-iliac strain. In the first, sciaticas are the exceptions, lumbagos the rule. The tilting of the pelvis and the apparent length of the limbs are the differential points. In functional spines the symptoms may be general, as is sometimes the case in sacro-iliac involvement but in the former spinal motions in the lumbar region are free and the entire spinal motion is frequently centered on one or two vertebræ but not restricted.

Sacro-iliac disease should not be confused with sacro-iliac relaxation. Sacro-iliac disease as described in many of the text-books is an entirely different entity, meaning that there is bony necrosis of the sacrum and surrounding structures.

### X-RAY OF THE SACRO-ILIAC JOINT

Heretofore to my knowledge no X-ray has been published showing a dislocated or strained sacro-iliac synchondrosis. In only a few have I been able to demonstrate this by the ordinary method of radiography. This is probably due to the obliquity of the joints in question and the frequency to reduce itself when the patient is quiet. The most accurate method of viewing the sacro-iliac joint and getting the true relations between the sacrum and ilium is by means of the stereoscopic X-ray. By this method it will be found that many of the cases show an open joint to a greater or less extent. In some cases I have been able to find that the posterior pelvic joints differ in the relation of

their parts at different times in the same patient. In a few cases it has been possible to take successive exposures of the patient at the same sitting, with and without pressure brought to bear upon the crests of the ilia, and at the same time hyperextending or flexing the spine with the hamstrings tense, with the result that the relation of the sacrum and the ilium could be changed at will. This was only possible in selected cases with complete relaxation of the pelvic girdle, and was found in the chronic type with a loose sacrum. In the acute traumatic which usually present actual subluxation this was not attempted owing to the fact that the motions were too painful. However in one case (see case 84, type B) I succeeded in getting a radiogram which distinctly showed an open right sacro-iliac joint with the left closed. Without the stereoscopic X-ray I feel confident that many plates of this kind pass uninterpreted. It is not necessary to rely upon the X-ray in making a diagnosis in all sacro-iliac joint cases; in some, only for the purpose of eliminating other causes.

### GENERAL TREATMENT

In the acute traumatic cases it may be necessary after the sacrum has been forced into place to keep the patient quiet in bed for some time until the soft parts have united. The ambulatory cases can generally be *held firmly* by a properly applied plaster jacket reaching well down over the hips and holding the spine in a hyperextended position. The jacket is applied with the most benefit by placing the patient over the Goldthwait irons, with pressure upon the sacrum. While doing this it may be necessary to manipulate somewhat the ilia upon the sacrum while the patient is in position for the jacket. In some cases it may be necessary to give an anæsthetic, and by several manipulative procedures force the sacrum back into its position, and then apply the fixation jacket. In some of the milder cases a firmly fitting webbing support may suffice. In others an Osgood brace attached to the corsets so as to cause constant pressure upon the sacrum will afford the necessary relief. When flat foot and faulty attitude are present they should be corrected, and in the latter condition a steel back brace applied so as to bring pressure upon the sacrum with counterpressure upon the ilia just below the crests. High heeled shoes are sometimes prescribed in the very mild cases. When uterine disease coexists, the pelvic girdle should be firmly supported by a plaster jacket or steel back brace, and the case further treated by a gynecologist. In cases with flat back the spine should be supported so as to overcome the obliteration of the lumbar spine. In many of the cases a pillow placed under the small of the back while sleeping will prevent dragging of the lumbar spine and the tilting of the sacrum backward at a time when the pelvic girdle is relaxed. It may sometimes be necessary to alternate between a steel brace and a plaster jacket, these to be replaced later on by a webbing jacket reinforced by heavy steels. And again a celluloid jacket with sacral pad incorporated to be worn during the day and a simple pelvic belt at night, is advisable in those cases in which the pelvic girdle is not able to support the trunk. When deformity exists it should be corrected if possible. Adhesive strapping firmly applied from crest to crest acts only as a temporary relief, after which other treatment should be given. Nerve stretching should never be resorted to in cases of sacro-iliac relaxation with sciatica as a symptom. In mild cases with a movable sacrum high heeled shoes may be all that is necessary, this depending upon the contour of the lumbar spine and the general poise.

### CONCLUSIONS

The sacro-iliac joint is a true joint and admits some motion normally. It may be subject to strain or complete subluxation as well as to the diseases which affect other joints. The pelvic girdle is the main support of the trunk, and when relaxed either by disease or physiological processes may jeopardize the sacro-iliac joint, causing a loose sacrum or an actual subluxation of the joint.

Many of the sciaticas are due to a slipping of the sacro-iliac joint, and many of the backaches, especially in women, are caused by sacro-iliac strain. Faulty attitude and flat foot in young and old may predispose towards sacro-iliac joint strain.

## ANALYTICAL TABLE OF EIGHTY-FOUR CASES OF SACRO-ILIAC RELAXATION

| Case No. | Age | Male or Female | Occupation | Chief Complaint | Etiology | Remarks and Complications |
|---|---|---|---|---|---|---|
| 1 | 54 | Female | Housewife | Pain in small of back day after operation | Traumatic (postoperative) | Operation on knee for osteoarthritis |
| 2 | 21 | Male | Student | Severe sciatica and stitch in back while dancing | Traumatic (following infectious arthritis) | Infectious arthritis rendered entire spine rigid |
| 3 | 28 | Female | Housewife | Pain in back since last child was born | General debility | Muscles flabby. Patient stands with round shoulders and with lordosis |
| 4 | 28 | Female | Housework | Pain over appendix and in left leg fr. hip downward | Traumatic (following deformity) | Marked old tubercular kyphos (mid-dorsal) |
| 5 | 10 | Female | School | Pain over sacral region | General debility (faulty attitude) | Extreme lordosis present |
| 6 | 46 | Female | None | Backache and occipital headache | Chronic uterine | Movable sacrum following peritonitis |
| 7 | 35 | Female | Housewife | Intermittent sciatica and pain in coccyx | Traumatic | Alexander operation had given no relief |
| 8 | 35 | Female | None | Pain in left hip | Traumatic (due to deformity) | Short limb. Old tubercular coxa vara present |
| 9 | 12 | Female | School | Growing pains and backache | Traumatic (mild) | Extreme lordosis |
| 10 | 37 | Female | None | Pain in right leg | Traumatic (faulty attitude) | Pendulous abdomen and flat foot |
| 11 | 40 | Female | Music teacher | Occipital headache and ache in small of back | Neurotic | Pendulous abdomen and general lipomatosis |
| 12 | 38 | Female | Housework | Ache in back and pain in both limbs | General debility | Flat foot and chronic uterine |
| 13 | 48 | Female | Housework | Backache | Chronic uterine | Pendulous abdomen also present |
| 14 | 54 | Male | Capitalist | Pain in thighs and back | Traumatic (secondary) | Osteoarthritis of the spine present |
| 15 | 18 | Female | Clerk | Intermittent backache | Uterine | Backache, especially noted at menstruation |
| 16 | 24 | Female | Nurse | Pain in spine when lying on back | Traumatic (postoperative) | Sagging of lumbar curve |
| 17 | 32 | Male | Farmer | Pain and stiffness in small of back and left hip | Traumatic (primary) | Patient had been lifting heavily |
| 18 | 52 | Male | Physician | Pain in limbs | Traumatic (secondary) | Pendulous abdomen and flat foot |
| 19 | 31 | Male | Chauffeur | Sciatica pain in right leg | Traumatic (primary) | |
| 20 | 22 | Female | Housework | Pain in left hip and sharp pain in back | General debility | Posttyphoid |
| 21 | 38 | Female | None | Pain in small of back and left hip | Traumatic (due to deformity) | Short limb and coxa vara |
| 22 | 38 | Male | Banker | Severe sciatica | Traumatic (primary) | Injury sustained while playing cricket |
| 23 | 34 | Female | None | Pain over sacrum and in both limbs | Traumatic (primary) | Following acute injury |
| 24 | 51 | Male | Peddler | Severe sciatica | Traumatic (secondary) | Advanced case of hypertrophic arthritis |
| 25 | 34 | Female | Housework | Pain in abdomen | Traumatic (due to deformity) | Patient had ankylosed spine |
| 26 | 27 | Male | Chauffeur | Pain in right hip and kink in back | Traumatic | Injury sustained while cranking car |
| 27 | 34 | Female | Housewife | Shooting pains down both legs | Uterine | Subinvolution following childbirths in rapid succession |
| 28 | 31 | Female | Clerk | Pain in small of back and in abdomen | Uterine | Ptosis of abdominal and uterine organs present |
| 29 | 28 | Female | Housework | Weakness of back | Neurotic | |
| 30 | 44 | Male | Physician | Stiffness and pain in back | Traumatic (secondary to osteoarthritis) | Had been riding in automobile with stiff springs |
| 31 | 24 | Male | Farmer | Pain in hips and small of back. Cannot sit straight | Traumatic | Patient listed. Pelvis tilted |
| 32 | 48 | Female | Teacher | Pain in limbs and both feet | General debility | Following nervous breakdown |
| 33 | 56 | Female | None | Pain in lower part of spine | Traumatic (following deformity) | Patient has short limb and pendulous abdomen |
| 34 | 48 | Female | Housewife | Weak back and sciatica | Chronic uterine | Alexander operation gave no relief. Later hysterectomy also gave no relief |
| 35 | 35 | Male | Conductor | Pain in both limbs. Cannot walk | Traumatic (primary) | Onset sudden |
| 36 | 62 | Male | Clergyman | Severe sciatica and kink in back | Traumatic (primary) | Onset sudden while jumping off car |
| 37 | 35 | Female | Clerk | Pain in right leg | Traumatic | |
| 38 | 20 | Female | Student | Intermittent sciatica | Uterine | Joint strain at menstruation due to flat foot |
| 39 | 35 | Male | Carriage trimmer | Sharp pain in abdomen, sciatica, and spinal curvature | Acute traumatic | Onset sudden while lifting automobile body |
| 40 | 31 | Female | Housewife | Dull pain in small of back and limbs | Uterine (subinvolution) | Has had children in rapid succession |
| 41 | 32 | Female | Housewife | General weakness while walking | General debility | |
| 42 | 13 | Female | School | Backache | Traumatic | Lipomatosis and lordosis |
| 43 | .. | Male | Physician | Severe sciatica with hyperæsthesia | Traumatic (primary) | Onset sudden. Elevator accident |

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|---|---|---|---|---|---|---|
| 44 | 23 | Female | Stenographer | Backache | Neurotic and uterine | |
| 45 | 38 | Female | Housewife | Pain in right thigh and left foot | Traumatic (deformity) | Patient has short limb following fracture |
| 46 | 32 | Male | Salesman | Cannot walk owing to sciatic pains | Traumatic | Onset sudden while jumping from car with heavy luggage |
| 47 | 24 | Female | Housewife | Severe pain in lower part of spine while walking | Uterine (subinvolution) | Case had been recently delivered by high forceps |
| 48 | 41 | Male | Printer | Sciatica in both legs. Pain in right ankle | Traumatic (secondary) | Osteoarthritis of lumbar spine also present |
| 49 | 38 | Female | Housewife | Weakness of back. Tiredness of limbs while walking | General debility | Flat back and chronic obliteration of lumbar spine |
| 50 | 30 | Female | None | Sciatica in left leg chiefly noted at menstruation | Uterine | Pendulous abdomen and extreme lordosis present |
| 51 | 52 | Female | Farmer's wife | Backache and pain in limbs | General debility | Patient had advanced organic heart lesions |
| 52 | 38 | Male | Engineer | Severe pain in right leg and kink in back | Traumatic (primary) | Acute injury sustained while lifting heavy rail |
| 53 | 38 | Female | Clerk | Ache in both hips | Traumatic (mild) | Lumbar spine subject to continual strain while sitting |
| 54 | 29 | Female | Housewife | Tenderness in sacral region | General debility | Weak back and round shoulders present |
| 55 | 28 | Female | None | Pain in limbs and left arm | Traumatic | Faulty attitude due to excessive automobiling |
| 56 | 32 | Female | Clerk | Pain in lower back | General debility | Complicated by phthisis |
| 57 | 45 | Female | None | Pain in lower spine and occiput | Traumatic and uterine | Alexander operation had been performed without relief |
| 58 | 46 | Female | None | Intermittent sciatica in left limb | Traumatic | Pendulous abdomen and osteoarthritis present |
| 59 | 17 | Female | School | Pain in small of back and cramps in calves | Uterine and general debility | Case complicated by acute nephritis |
| 60 | 38 | Female | None | Pain in right limb, chiefly noted at night | Neurotic | Relaxation and sagging of lumbar spine occurred in bed |
| 61 | 60 | Female | None | Pain in limbs and small of back | Traumatic | Pendulous abdomen and lipomatosis present |
| 62 | 35 | Female | Housewife | Pain in back | Traumatic (postoperative) | Symptoms first noted after thirteen weeks recumbency |
| 63 | 42 | Female | Housewife | Pain in both sides of abdomen and small of back radiating downward | Traumatic | Subinvolution of uterus and chronic flat foot present |
| 64 | 33 | Female | Student | Pain in small of back | Neurotic | |
| 65 | 54 | Male | Physician | Stitch in back | Traumatic | |
| 66 | 34 | Male | Laborer | Severe sciatica | Traumatic | Onset sudden while lifting heavily |
| 67 | 24 | Female | Stenographer | Pain in right hip | Uterine | Strain on sacrum due to sitting posture |
| 68 | 28 | Female | Housewife | Legs flexed. Unable to move without severe sciatica | Uterine (following childbirth) | Complete fracture of symphysis pubis with peritonitis |
| 69 | 65 | Female | None | Pain in back while in recumbent position | Traumatic (secondary) | Patient very obese |
| 70 | 38 | Female | Housewife | Pain in limbs and lower part of spine | Uterine | Patient has had coccyx removed without relief |
| 71 | 35 | Male | Physician | Sharp pain in back | Traumatic (primary) | Onset sudden while setting brake of automobile |
| 72 | 28 | Female | Housewife | Weak spine, especially noted during menstruation | Uterine | |
| 73 | 30 | Male | Merchant | Severe sciatica in left leg and pain in back | Traumatic (primary) | Onset sudden while lifting stove |
| 74 | 50 | Female | None | Dull ache in back when standing | Traumatic (secondary) | Pendulous abdomen. Weight excessive |
| 75 | 20 | Male | Clerk | Pain in back and groin | Traumatic (secondary) | Rigid spine present due to infectious arthritis |
| 76 | 19 | Male | Laundry work | Sudden sciatica in right leg while at work | Traumatic (primary) | Body bent to one side |
| 77 | 24 | Female | None | Cannot sleep owing to pain in back | General debility | All muscles flabby |
| 78 | 41 | Male | Waiter | Dull ache in limbs while standing | General debility | Complicated by specific disease |
| 79 | 49 | Female | None | Inability to walk owing to pain in back | Traumatic (primary) | |
| 80 | 45 | Male | Foreman | Pain in lower back. Body bent to left side when walking | Traumatic (primary) | Onset sudden nine months previous |
| 81 | 42 | Female | None | Pain in small of back when standing | Traumatic (secondary) | Straight front corsets had habitually been worn |
| 82 | 50 | Male | Horseman | Pain in small of back shooting down thighs | Traumatic (secondary) | Osteoarthritis of spine and knees present |
| 83 | 31 | Female | Music teacher | Pain in lower spine and fatigue of back | Traumatic (primary) | Occupational |
| 84 | 32 | Female | Housewife | Stitch in back since birth of last child | Uterine and general debility | Subinvolution of uterus and phthisis |

The degree of motion in the sacro-iliac joint may vary greatly. This motion is usually more marked when the patient attempts to walk. A pendulous abdomen may strain the joints giving rise to subjective symptoms. Direct or indirect muscular violence is one of the common causes of strain in these joints, as is likewise a general debility, whether due to the weakening results of disease or general suboxygenation. Gynecological cases which present symptoms of backache which have not been relieved are very often the result of trouble in the pelvic girdle.

The diagnosis in these cases must be carefully made with due reference to the paramount symptoms, an analysis of which may help to establish a diagnosis. In cases presenting vague symptoms of backache which cannot be accounted for, a thorough physical examination may disclose the chief trouble to be in the sacro-iliac joints. The early diagnosis in cases with mild symptoms is important from the therapeutic standpoint. By an early recognition of these milder cases chronic invalidism and neurasthenia may often be prevented. In the acute cases with sharp pains and spinal curvature early treatment may give immediate relief. All cases of sacro-iliac relaxation should not be treated dogmatically by fixation. The success of the treatment depends upon the recognition of the etiological type to which the case belongs. Sacro-iliac joint strain is more common than is generally supposed, and is found both in the old and young, either primary or secondary to other affections. When existing the patient will not make a permanent recovery until the pelvic girdle has been properly supported, and the joint strain relieved. When the pelvic tumors exist, they should be removed, after which the pelvic girdle should be supported by a properly fitted apparatus.

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## THE EARLY DIAGNOSIS OF CANCER[1]

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MY chief regret is that my feeble efforts in the line indicated by the title of the paper have resulted in negative rather than positive findings. I will, therefore, devote but little of your time to my own experiments, but will attempt to briefly review some recent attempts at early diagnosis.

To say that surgical technique has reached perfection would, in the light of past history, be a rash and thoughtless statement but, I believe, we may with perfect propriety, say that the development of the technical side of surgery may rest temporarily while awaiting an equal development in the diagnostic branch.

We are in need to-day, not of technical improvements or modifications, but of new or improved methods of arriving at an earlier recognition of pathological conditions so that we may apply our present methods at a time in which they can be more effectual.

Good surgical results depend, not so much upon the technique as upon correct and early diagnosis, with recognition of proper indications for, and limitations of, the operative procedure. The present day surgeon must possess, in addition to technical ability, the power to recognize and *exclude* all functional diseases and to recognize and *include* all cases of early malignancy. With increased study, the functional disorders are becoming less common, and cancer much more frequent than had been supposed to be the case.

That the cancer problem is the most important question before the medical profession to-day cannot, I believe, be questioned. The reason for its importance may be found in *two* facts; *one* that cancer is rapidly increasing; and the *other* that despite all our information regarding the condition, we have no definite knowledge regarding its cause. All that we have learned regarding cancer, up to within

[1] Read before the Chicago Medical Society (by invitation) April 5, 1911.

the past few years, has been the result of clinical observation, with macroscopic and microscopic study of the cancer tissue. But with the recent demonstration of the fact that cancer does occur in animals, notably mice, and that it may be transplanted from one animal to another, the subject has been studied as a laboratory experiment; a deeper insight and more reliable knowledge has been thus gained, but still, the secret as to the cause, and the specific cure, is as much a mystery as it was when the condition was first described.

An enormous amount of research in this field has been carried on, the aim being, primarily, to discover the cause, which will certainly be of great aid, but it will, when discovered, not necessarily mean a clearing up of the entire problem. While the majority of researches have concerned the etiology, a smaller number have been carried on in the hope of discovering some specific cure, or a new line of treatment. Empirically, nearly everything imaginable has been used, and recently various attempts at a rational or scientific treatment have been presented. For example, such methods of treatment as that suggested by Hodenpyl, the injection of ascitic fluid from a case of spontaneous cure.

Mackay (B. M. J., Sept. 3, 1910, p. 663) advises the removal of ascitic or peritoneal fluid from cancer cases, and the subcutaneous injection of this fluid into the same patient.

Vaughan recommends the injection of the specific non-toxic residue of the cancer cell.

Coca and Gilman, inject the extract of malignant tissue.

Shattuck and Dudgeon (B. M. J., Nov. 26, 1910, p. 1720) found that air dried mouse cancer cells were inert, and Haaland the same with pressed extract.

Jensen was the pioneer in this line of treatment, as he suggested that patients be treated with their own cancer cells, that is, an attempt at vaccination.

Beebe (J. A. M. A., Nov. 12, 1910, p. 1716) has treated one case of mammary cancer, after removal, with an active cytolytic serum produced from the cancer.

Von Dungern (Ehrlich collected papers, second edition, p. 56) was able to obtain a specific epithelial immune serum by the injection of cow's milk and therefore reasoned that serum immune to human milk might prove useful in mammary cancer, but, thus far the treatment of animals with human milk has not yielded an immune serum.

Because cancer is common at the time the generative glands cease to functionate, Sherrington, of London, injects an extract of testicle, which he calls "spermine."

Oestreich (B. M. J., Oct. 15, 1910, p. 1177) injects condroitin sulphat which he calls "antithuman" for the rather ingenious reason that this is the most common constituent of cartilage and arterial wall. And as these structures are so frequently not involved in the extension of cancer, he thought that they must contain some substance inhibitory to the growth of cancer.

Fischera, of Rome (J. A. M. A., Aug. 6, 1910, p. 545) places crushed embryos in salt solution until they dissolve by autolysis, and injects the resultant fluid. The philosophy being that cancer is due to an overproduction of epithelial cells, and that an extract of such embryonal cells furnishes the necessary check for this overproduction.

The above is but a very incomplete list of attempts at treatment, and needless to say, none is accepted as a recognized method. With the initial report, in most cases, a number of cures are reported but in all instances they fail of corroboration in the hands of others. Attempts at specific treatment, such as those above enumerated, are encouraged by the fact that there is such a thing as a spontaneous recovery from cancer. A few years ago, all such recoveries were supposed to follow mistaken diagnosis, as was at one time the case with recovery from tuberculosis, but now the fact is admitted and many undoubted cases reported and accepted. There is evidently a natural resistance of the human body to cancer, and the object of these various methods of treatment is to stimulate or aid this natural resistance or immunity. All of which brings us back to the encouraging, but frequently overlooked, fact that we have to-day a satisfactory treatment, that is, complete excision.

This will, of course, be improved upon, but,

while searching for better weapons, we must not fail to utilize that which is at hand. There is logic, to be sure, in the position taken by those who contend that, even with complete and satisfactory removal of a malignant growth, nothing has been done to remove the underlying and unknown cause, or to prevent the development of similar growths elsewhere. But as long as a large proportion of patients, from whom malignant growths have been entirely removed, do not develop independent cancers elsewhere, and until a better line of treatment is presented, we shall be forced to continue to rely upon *complete excision* of the growth, as a cure for cancer. In the vast majority of the cases, the reason that the results are unsatisfactory is, not because the line of treatment is inefficient, but because it is rarely instituted at the proper time, that is, *early*.

It is generally admitted that cancer in its beginning is a local disease. If recognized *early*, while still *local it is curable*. Cancer is rarely recognized while still local, therefore the necessity of early recognition. This early diagnosis is the most important phase, to-day, of the cancer problem.

Diagnosis of cancer *per se* is most difficult, because there are no known signs or symptoms of the condition itself. The signs and symptoms that we see in our cases, and read in our text-books, are not those of the disease itself, but of its consequences. This point has been well emphasized by Otto, of Copenhagen, who at the last International Cancer Conference in Paris, reported a study of the duration of the disease, between the first symptom and death, in 196 cases of gastrointestinal malignancy, and concluded that the first recognizable symptom appeared, and the diagnosis was made, subsequent to a long latent period.

Inaugural signs and symptoms are wanting; those with which we are familiar are what might well be called terminal. The symptomatology will have to go through the changes that were necessary in appendicitis; in which for a long time the symptoms attributed to this condition were not those of appendicitis but those of a perforative peritonitis. The same has been the history of gastric and duodenal ulcer; they were not recognized, as such, and were not detected until secondary complications had arisen, such as hæmorrage, stenosis, or perforation. The same evolution has been passed through in gall-stones and many other conditions, and such a progressive step is sadly needed to-day in the condition called cancer.

Earlier diagnosis may be achieved in one of two ways: (1) by educating the profession, and in turn, the laity, to the fact that certain signs and symptoms, which heretofore have been misinterpreted or ignored, may be early evidence of cancer, (2) by the discovery, or the creation, of some diagnostic test that will prove the presence of cancer in its beginning or earliest stages.

In the campaign of education, the lesson to be driven home is that cancer is to be suspected in the great majority of chronic conditions, of which the exact nature is not definitely known, and suspicion to be promptly followed by careful study with either the exclusion, or the demonstration of, the disease.

The knowledge regarding the possible serious significance of certain supposedly trivial symptoms, does practically no good to anyone, as long as it is confined to the profession; it must be known by those in whom cancer is liable to occur. The very satisfactory results following such a campaign of publicity by Winter and others in Germany is, of course, well known to you all.

In attempting to discover some distinctive indicator of early malignancy, the excretions have been diligently searched. The feces have revealed nothing of greater value than the presence of "occult" blood, which is of limited utility.

Urinary findings, distinctively characteristic of maligancy, have been wanting.

Gastric analysis, even in cancer of the stomach, is far from pathognomonic.

A new test for cancer of the stomach, the glycotryptophan test of Neubauer and Fischer, is the latest to be presented, this has been simplified by Weinstein (J. A. M. A., 9-24-10) who reports favorably.

My personal experience has been too limited to allow an expression of opinion. But Ley (J. A. M. A., 2-25-11, p. 627) was dis-

couraged by finding contradictory and unsatisfactory results in twenty cases in which he applied this test.

The blood of cancer patients was studiously examined in the early days of hematology, but characteristic morphological changes in the cells were not discovered; counts, of either the white or red cells, and estimation of the hemoglobin were found to be of no distinctive value. Moffram found by spectrum analysis, that the potassium content of the red corpuscles in cancer patients is considerably higher than in health.

It is interesting to note that Baradulin (A. J. M. S., Jan., 1911, p. 129) in the latter part of last year made a most comprehensive study of the blood findings in seventy-two cancer patients and concluded that no diagnostic significance may be placed upon the variations of the different constituents of the blood.

Such observations, a few years ago were looked upon as the highest refinement of diagnostic methods, but to-day when compared with the immunity reactions, they are as is gross morbid anatomy when likened to histopathology.

This subject of immunity has opened up a field in medicine, which is, from what we can now see, boundless and within which all things in medicine may become possible. Immunity in relation to cancer has been studied from a therapeutic basis and, to a less extent, from a diagnostic point of view.

The various immunity reactions have all been tried in attempts to diagnose cancer. The principle involved in the agglutination phenomenon, known clinically as the "Gruber-Widal" reaction in typhoid, was applied by Greenbaum and Ascoli in 1900, but with unsatisfactory results.

The precipitin test, analogous to the Wasserman-Uhlenhuth blood test, has been found to be inapplicable to cancer.

Yet Freund found that serum of cancer patients induces precipitation in cancer extract, precipitation not being obtained under other conditions. He found this turbid precipitation with the serum of fifty-four cancer patients, while it was constantly absent in serum of forty-five non-cancerous patients.

The hemolytic test was applied by Kelling and was given great prominence in this country because of the enthusiastic reports of Crile, who pronounced it practically pathognomonic. But his results have failed of confirmation in the hands of the majority of those who have used the test. In a recent collection of reports, by Krida, only 67 per cent were positive in nearly 500 cases collected from ten different observers.

Kelling (J. A. M. A., 2-25-11, p. 629) still reports favorably on the method.

The simplification of this hemolytic test by Elsberg, in which the hemolysis is carried on in the body of the patient instead of in the test tube, has likewise failed to be generally accepted as reliable.

Freund (Wein. klin. Woch., 8-25-11, No. 34, p. 1221) has demonstrated that the serum of normal individuals has a destructive action upon cancer cells, this he attributes to the lecithin element.

Serum from cancer patients was found not only to lack this lecithin, but to contain, in addition, some substance that protects the cancer cell.

Normal serum dissolved human and mouse cancer cells, while serum from a person with cancer has lost this property.

Neuberg independently discovered that a suspension of cancer cells cleared up after the addition of normal serum. (The value of these facts in *early* diagnosis has not been determined, as yet.

Rudolph Kraus and Graff (Wein. klin. Woch., 2-9-1911, xxiv, No. 6, p. 191. J. A. M. A., 3-18-1911, p. 859) have made the interesting observation that serum from the placenta is non-destructive to human cancer cells.

Crile (Trans. South. Surg. and Gyn. Assn., 1909, xxii, p. 205) has noted that he was unable to make successful isodermic grafts in cases of cancer in which there was metastases, or in which all of the disease had not been removed. Autodermic grafts would grow actively. In some instances there was a temporary growth, soon followed by dermatolysis of the isodermic grafts.

There is no mention of any attempt to transplant skin from one cancer patient to another with the same disease.

In connection with these different conditions that may result in cytolysis of the cancer cell, it must be remembered that Handley and others have demonstrated a destructive action of the lymphatic and vascular endothelial cell, on the detached and intravascular cancer cell.

The biologic test known as complement fixation, or deviation of complement, best exemplified in the so-called Wassermann reaction, has been satisfactory and accepted in syphilis, but when applied to malignancy has been discouraging.

Work with blood serum led to the demonstration of the fact that normal blood serum has an antitryptic action, by which is meant, the faculty of antagonizing or inhibiting the digestive activity of the ferment trypsin. It was soon found that this power varied with different pathological conditions and might be either increased or decreased. An increase in the inhibitory value of a serum has been claimed by some to be characteristic of cancer, but this has still to be confirmed.

The technique has been difficult and time consuming, but the details have recently been simplified so that the method may come into more general use.

The latest attempt in this type of diagnosis is the so-called meiostagmin reaction of Ascoli (meio, small, stagmin, drop). This test calls for the stalagmometer of Traube, by means of which one may determine the exact number of drops in a given quantity of fluid. The surface tension of an immune serum and its specific antigen is determined before, and after, incubation.

A lowering of the surface tension, as shown by an increase in the number of drops by two or three, consists of a positive reaction. This was applied in cancer by Ascoli and Izar in 1910, and in 62 malignant cases, 58 were positive. These results are startling and, if confirmed by independent observers, will be of great value.

Stabilin (B. M. J., 12-24-10, p. 100) and Kelling (J. A. M. A., 2-25-11, p. 629) in recent articles report satisfactory results. But unfortunately, the technique and preparation of the antigen is difficult and the margin of error is quite large.

Anaphylaxis is a phenomenon very closely related to immunity, in which a guinea pig may (by the injection of a very small amount of a harmless proteid) be made so susceptible to this proteid, that, at a second injection, severe illness or even death may result.

This has been observed for many years, and in 1904 was given by Bichat, the name anaphylaxis, from the Greek, *ana*, against, and *phylaxis*, protection, that is, the opposite of prophylaxis. Hypersusceptibility and supersensitiveness are other terms that have been applied to this condition. With the use of therapeutic and diagnostic sera, this condition was observed with increasing frequency, and in 1905 Von Pirquet described the "serum disease" which follows the injection of horse serum in man, and is but a subdivision of anaphylaxis.

Most important experimental work has been carried out in this country by Rosenau and Anderson, at the U. S. Hygienic Laboratory at Washington, D. C., and, as a result of numerous experiments, it has been found that anaphylaxis may be caused by any proteid substance, either animal or vegetable: that an interval of from seven to ten days must occur between the two injections and that the sensitizing dose may be wonderfully small, the usual dose being from 1–500 to 1–250 of a cc., but 1–100,000 of a cc. has been sufficient. This sensitized condition may be transmitted from mother to young, and, of great importance, the reaction is specific, i. e., it occurs only when the same identical proteid is administered at the second injection.

The reaction manifests itself by symptoms of respiratory embarrassment, convulsions and paralysis; these symptoms usually come on within ten minutes after injection, and death occurring within a few minutes.

Death is due to failure of the respiratory centers, and the autopsy reveals nothing of significance.

The symptoms may vary from those serious reactions that terminate fatally, to such slight spasms that they may very easily be overlooked or misinterpreted. Among the theories explanatory of this peculiar condition, that advanced by Vaughan is, perhaps, the most rational.

"If one were to drink a given amount of horse serum, the digestive ferments would split up this complex proteid into simpler chemical groups before actual entrance into the body was gained. The resulting albumoses, peptones, peptids, and amidoacids, when absorbed by the lymphatic channels, are easily converted into human proteids through the action of enzymes normally present for this synthetic function. However, if the horse serum should enter the body tissues without first having passed through this process of reduction, the situation is entirely different. Here a complex foreign proteid has gained entrance into the body tissues as such. In this form it is of no nutritive value, since the body tissues have not the power to convert it to such a purpose in its present complex state, and its reduction into less complex radicals must be accomplished before it can be either used by, or excreted from, the body. In order to bring about this destruction, certain cells of the body must react with the foreign proteid chemically before its reduction can occur. This process is one that takes an appreciable time to perform, and one which seems to vary somewhat with the nature of the foreign proteid as well as with the tissue activity of the host. In many instances ten days or two weeks must elapse before all of the foreign proteid is removed. In accomplishing this result, nature forms a larger percentage of the specific enzyme than is needed for the removal of the amount of proteid given, so that if a second injection of the same proteid be given,— let us say three weeks after the first introduction has been made,— a certain definite amount of this new ferment is present, which is immediately available for the splitting up and removal of the foreign substance.

Since every proteid contains a toxic radical, this is a source of danger to the individual who receives the second injection, for if the amount of foreign proteid entering the body is sufficiently large, and if there is enough active enzyme present to liberate a fatal amount of the toxic group, the amount of poison suddenly thrown upon the host may be large enough to be fatal." (Michigan State Med. Journal, 2, 1911.)

As a diagnostic measure, anaphylaxis has been utilized in tuberculosis by Rosneau and Anderson, and by Baldwin of Saranac Lake, but with unsatisfactory results.

Yamanouchi (J. A. M. A., 1-9-10, p. 172) injected blood or serum into rabbits, and by injecting tuberculin twenty-four hours later, caused death in those animals that had been injected with serum from tubercular patients. This experiment I repeated in four cases with a uniformly negative result.

Roepke (J. A. M. A., 11-27-09, p. 1868) very promptly questioned the results attained by Yamanouchi, and Krause (Studies from the Saranac Laboratory, 1904–1910) failed to corroborate his findings.

Roepke (Beit. zur Klinik der Tbc., xviii, No. 3, p. 303. J. A. M. A., March 18, 1911, p. 854) after extended study, concludes that the anaphylactic properties possessed by the human being with tuberculosis, cannot be transmitted to the guinea pig, and that the serodiagnosis of tuberculosis is not practicable.

Ebright (Am. J. M. Sci., Sept., 1909) attempted to reduce the time before tubercle bacilli might be demonstrated in guinea pigs, after injection with suspected material, by a subsequent injection of tuberculin.

H. G. Wells (J. A. M. A., 9-11-09) differentiated, by means of anaphylaxis, between serum and egg albumen.

On two occasions, I attempted to differentiate between pregnancy and fibroid of the uterus, by means of anaphylaxis. One guinea pig was injected with serum from the patient, and a second pig, with serum from a non-pregnant person. Ten days subsequently both pigs were injected with juice from crushed placental tissue, after prolonged washing in normal salt solution to remove as much blood as possible. There was no reaction in either instance.

Because of the facts that this anaphylactic reaction is specific, that is, takes place only when the identical proteid is injected at the second dose; and that the first or sensitizing dose may be very minute in quantity, led me (in March, 1909) to apply it, in an effort to arrive at a simple method of recognition of early cancer.

The technique consisted of the subcutaneous injection into guinea pigs of a small amount, .01 cc., of blood serum from a cancer patient, hoping in this manner to administer the sensitizing dose of a certain unknown substance that the hemolytic test led out to believe was present in the blood of cancer patients and not in that of normal individuals. As a control, a second pig was at the same time injected with serum from an individual known not to have cancer. After the elapse of ten or more days each pig was injected with from three to five cc. of juice, pressed from cancer tissue, after thorough washing in normal salt solution.

These steps were carried out in fifteen pairs of guinea pigs; there were only four positive results, two of which died in the typical manner, and two recovered after exhibiting less severe symptoms of anaphylactic shock. In no control did anaphylaxis occur.

Because of these unsatisfactory results, I was about to discard the method, when I noted that two Germans, Pfeiffer, and Finsterer, had been working along similar lines and had found that pigs untreated, or previously injected with normal serum, when subsequently injected with cancer juice gave no reaction: but on the other hand, pigs injected with serum of cancer patients, and 48 hours afterwards injected with cancer juice, show anaphylaxis, by a drop in the temperature.

As I had made no temperature observations in my experiments this report of Pfeiffer and Finsterer, called for a repetition of the work. This was done in five cases, in every case there was a fall of temperature.

8½° in 1 hour, with anaphylaxis.
4 ° in ¾ hour, with anaphylaxis.
3 ° in 2 hour, with no anaphylaxis.
2 ° in ½ hour, with no anaphylaxis.
1 ° in 1 hour, with no anaphylaxis.

In the two instances in which there were definite signs of anaphylaxis, there was a marked drop in the temperature. There was no marked fall of temperature after the first injection, nor in the controls.

The accuracy of Pfeiffer and Finsterer's observation was at once questioned, and Krause says that the temperature of these animals is readily affected by excitement and trauma, and that no especial significance attaches to its variations.

In my observations trauma, excitement, or fear, had no influence on the temperature.

No less an authority than Kelling has within the last few months published a series of experiments in which the extract of embryos was used for the second injection with a resultant fall of temperature in a large proportion of the cases of malignancy.

Andrewes (Lancet, July 2, 1910) who has made a very careful study of the blood in anaphylaxis says "I am inclined to think that initial leucopenia is a more delicate test for the occurrence of the reaction between antigen and antibody than the clinical symptom of anaphylactic shock." He has never seen the shock without some degree of leucopenia but he has seen marked leucopenia without any symptom of constitutional disturbance.

From this study, brief as it is, we may conclude that at the present time the anaphylactic test for cancer is no more reliable than the other immunity reactions have proven to be.

(After concluding this work and presenting it at the Wisconsin State Society in June, it was very interesting to note, in the J. A. M. A. of Sept. 10, 1910, two articles from the Italian on "Negative Experimental Research on Anaphylaxis in Carcinoma.")

Ranzi (Von Pirquet, Achiv. Int. Med., Feb. 1911, p. 273) tried to use the anaphylactic reaction for the differential diagnosis of malignant tumors, but with unsatisfactory results.

The failure may possibly be explained by the fact that a foreign albumen has not been demonstrated in the cancer cell, and that an antibody to the cancer cell, similar to those in the usual bacterial infection, has not as yet been demonstrated.

A definite conclusion regarding the value of the antitryptic index, and the meiostagmin reaction must await a more extensive trial.

# THE BRADYCARDIA OF THE PUERPERIUM

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THE first description of the slowing of the pulse during the puerperium is frequently ascribed to Blot in 1864, yet it requires but the briefest review of the literature to indicate that the credit is not rightfully his. It is difficult to isolate the one who first described it, yet we have strong suggestions that it was known to the ancients. That the phenomenon was known to the ancient Chinese may be evinced by the diction in Pfizmaier's "Die Pulslehre Tschang Ki:" "Ist die Geburt soeben erfolgt, so ist Kleinheit und Langsamkeit: bei Vollheit Straffheit, Festigkeit, Grösse ist das unglück nicht zu vermeiden." "Der Kleine und langsame puls wird in der Erklärung als von guter vorbeutung bezeichnet." In more recent time we find many who also mention this phenomenon, unaware doubtless that it had been described by others. Thus we find reference made of it by Levret (1766), Cirillo (1802), and Capuron (1811). In 1857 W. E. Montgomery wrote of it in a Dublin journal under the heading of "Retardation of the pulse after labor," and MacClintock's much quoted observations appeared four years later. Moreover immediately preceding the paper of Blot appeared the publications of Levy (1862) and Pastorello (1863).

Yet credit is due Blot for first presenting in a complete and careful manner his many observations concerning this phenomenon. His paper, which was based upon the study of 246 parturient women, created a profound sensation when read before the Paris Academy in 1863. It was published the succeeding year. Blot presented the following conclusions:

1. That there generally ensues in normal puerperal women a more or less clearly marked slowing of the pulse.

2. It is not limited to women who normally have slow pulses at other times.

3. The range of the pulses varies considerably, yet commonly oscillates between 44 and 60. In three cases the pulse fell to 35 per minute. The phenomenon is not influenced appreciably by the alimentary tract.

4. The condition is more common in multipara than primipara, doubtless because of the greater tendency to complications in the latter.

5. The duration of the fall varies from a few hours to ten or twelve days, and is usually more prolonged in the cases which present the slowest pulses, provided always that there are no complications.

6. It begins usually in the 24 hours following delivery, becomes accentuated, remains stationary, and gradually disappears. It may persist even while there is "milk fever," a term often erroneously applied.

7. The duration of labor does not profoundly influence the phenomenon, which disappears, however, upon the advent of pathological conditions. The pulse is retarded not only after labor at term, but also after abortions and premature labors, whether spontaneous or induced. The ordinary afterpain does not influence it, yet hæmorrhage may, unless the amount is very slight.

8. Changes in the posture of the patient cause marked changes in the rate.

9. The slow pulse is a most favorable symptom, and its frequent occurrence in a hospital reflects the excellence of the sanitary conditions. The reverse condition, a rapid pulse, often proclaims the advent of morbid conditions which so frequently appear in epidemic form.

10. Whatever is the cause, it cannot be ascribed to nervous exhaustion, because the sphygmographic tracings indicate an increase of arterial tension.

Shortly following Blot's publication, the literature became flooded with the observations of many investigators who recorded their findings with the sphygmograph which was then becoming a favorite instrument with students of the circulation. Naturally there accumulated a great number of observations, which together with their interpre-

tations, forms a considerable literature. In a general manner the results of the later workers corroborated the findings of Blot. There is not, however, complete agreement as to details. Falaschi showed that a slow pulse is not found in abortions prior to the fourth month. Others found that hæmorrhage and the shock from operative procedures aimed at delivery held the fall in abeyance. There was not an agreement as to what constituted the average rate of the puerperal pulse. Thus while Blot stated that the average of the pulse ranged between 44 and 60, Vejas found but 60 per cent of 50 cases which presented pulses under 72. Falaschi observed slow pulses in but one quarter of his cases. Olshausen found that 63 per cent of 348 cases had pulses of 60 or under, while Hémey's careful study showed a similar condition in but 16.2 per cent. Winckel observed puerperal pulses between 60 and 51 in 38 per cent of cases, while in 22 per cent they were between 50 and 39. Löhlein, on the contrary, found pulses below 50 in but 6.5 per cent of cases, which findings agree with Knapp's observations. All agree that the slow pulse is more common in multipara than primipara. Blot showed the ratio as two to one, Louge as four to one, Vejas found a fall in two-thirds of the multipara and half of the primipara.

The average rate of slow pulse varied in different series. Olshausen took it as from 40 to 50; Falaschi as 44 to 50; Blot as 44 to 60; Hémey as 48 to 52; Louge as 50 to 60; Torggler as 60 to 80; and Vejas as 72 to 78.

There is also considerable variation as to the day on which the maximum of fall was observed, and various periods between one and twelve days are recorded. Thus we find the maximum of fall:

A few hours after birth, Vejas, Carl.
After twenty-four hours, Fritsch, Knapp.
Fourth to sixtieth hour, Falaschi.
End of second day, Blot.
Second to fifth day, Fehling.
Fifth to seventh day, Olshausen.
Fifth to eighth day, Löhlein.
Morning of seventh day, Louge.
Evening of seventh day, Baumfelder.
Seventh to ninth day, Deubel.
Ninth day, Meyburg.

The slowest pulses recorded are by MacClintock, 30 beats to the minute, following the delivery of triplets; Olshausen, 34; Blot, 35; Meyburg, 36; Falaschi, 38.

Practically all the authors quoted state that the slow pulse after labor is a physiological phenomenon and constitutes a true fall in the pulse rate. It is apparent to any one that it is necessary to know the pulse rate of the individual both before and during pregnancy, before we can show that a fall in the rate has occurred in the puerperium. Critical study of the work quoted above shows that no series complies with these postulates, and that only Hémey and Vejas made their observations on the same women before and after delivery. The others took an arbitrary rate for the normal patient during pregnancy, and it is of interest to note that few authors took the same rate for the normal. Moreover, others considered as a pronounced slowing, a pulse five beats below the figure arbitrarily taken as the normal pulse of pregnancy. It is little wonder then that Heil reviewed the subject in 1898 in an article entitled "Giebt es eine physiologische Pulsverlangsamung in Wochenbett." His article was based upon the study of 100 cases in the gynecological wards and 100 cases in the obstetrical wards of Kehrer in Heidelberg. His conclusions may be briefly summarized.

The pulse in 100 women who were not pregnant but who had been in bed for several days, frequently fell below 75. In 49 per cent of cases it reached 65 and lower. These women were in the clinic for treatment of slight grades of endometritis, stenosis of os cervix, etc.

In pregnant women, after one-half hour's rest in bed, the morning pulse fell below 75 in 60.8 per cent; below 65 in 24.5 per cent; and below 60 with a minimum of 48 in 11.5 per cent of cases.

Pulses of 65 and lower were observed more frequently in pregnancy than in the first ten days of the puerperium.

The average of the pulses during pregnancy was higher than that of the puerperium in 45 per cent of cases.

The average of the pulses during the puer-

perium is ten or more beats slower than that of the pregnancy in but 12 per cent of cases, 2 per cent being primipara and 10 per cent multipara; in 22 per cent of cases it was between 5 and 10 beats slower.

A curve of the daily average puerperal pulse shows a range from 71 to 75 during the first eight days, with 78 on the ninth day and 81 on the tenth day.

Even admitting that there are errors in conclusions from a small number of cases, Heil does not believe that there is a physiological slowing of the pulse which is limited to the puerperium in the sense that has hitherto been held.

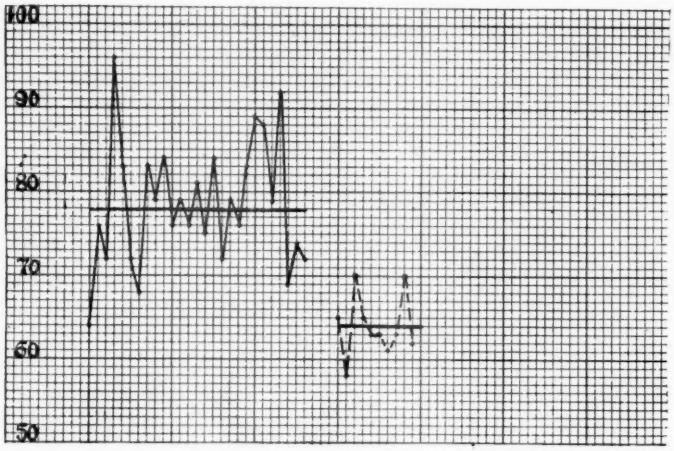
Aichel in Erlangen in 1901 tabulated the average pulse of 79 absolutely normal women. His study included the last ten days of pregnancy and the first ten days of the puerperium. The average daily pulse in this series oscillated between 70 and 78 in both pregnancy and the puerperium. In only six cases (7.5 per cent) was there a fall in the average pulse rate during the puerperium. In 61 cases (77 per cent) was the pulse the same, and in 12 cases (14 per cent) was it the higher in the puerperium.

Varnier in 1900 reported two series of cases. All the pulses were counted at nine o'clock in the morning while the patient was in bed. We must omit from our consideration the first series because it does not deal with the same women in pregnancy and the puerperium. The second series meets all requirements save the small number of cases observed (36 cases). His conclusions are of the greatest interest in that they show that the pulse fell during the puerperium in 72.2 per cent of the cases of the series, and was higher in but 11.1 per cent.

Various theories have been propounded by those who have described a slowing of the pulse rate during the puerperium. We believe that the list exhausts nearly all of the possibilities. Thus, Kehrer ascribed the phenomenon to the lowering of the blood pressure after delivery; Schroeder, to the sudden diminution of the maternal vascular area after the uteroplacental circulation is thrown out of function; Löhlein, to the stimulation of the vagus or other nervous influences; Olshausen, to the absorption of various products set free in the blood during the involution of the uterus; and Kehrer, to the horizontal position and rest in bed.

My attention was directed to this subject some years ago when, as a medical student, I was unable to observe a slow pulse in any of the cases to which I was assigned on obstetrical duty. I still recall my fears lest these women had been infected by me. We began this investigation in 1901 in the clinic of Prof. Williams in Johns Hopkins Hospital, for the purpose of controlling the reports of Heil and Varnier, recognizing that unusual opportunities were afforded in a clinic which was maintained primarily for teaching, and thus held many patients under observation for long periods of time for use in the teaching of palpation and pelvimetry. In all, more than 250 cases were followed, but this number became decimated by incomplete records, as well as by the advent of complications in many cases. My thanks are due Prof. Williams for the use of his cases.

We have attempted to consider only normal cases and have therefore excluded all which presented albuminuria other than in the faintest traces and not accompanied by casts, hæmorrhage, breast complications, sloughing of sutures, a temperature continuous above 100° F. for more than eight successive hours, etc. All the women nursed their children and all children were full term. There are many sources of error in a work of this character, many of which cannot be controlled. One possibly is in the use of chloroform in very small amounts during the second stage of labor, as well as for complete anæsthesia in the cases of perineal repair. We have sought to limit this error by the exclusions of all cases with lacerations more serious than simple first and second degree tears requiring less than four or five sutures. That error from this source is not considerable is proven by the data obtained in a series of 19 primipara which were delivered by low forceps or breech extractions not indicated by maternal exhaustion. Nine of these cases presented a slower pulse average in the puerperium than in pregnancy by from 3 to 10 beats, while in only two cases was the condition reversed.




Primipara. Fall of 14 beats.

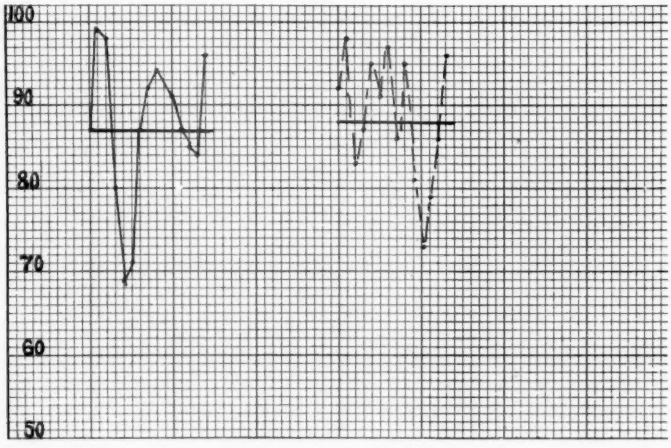
This is practically the same as the percentages obtained in the series of spontaneous births in primipara, and for that reason have been included in our series. All other cases had spontaneous births. Attempt was made to take all pulses at 9 A. M., but after fifty cases the hour was changed to 7 P. M., at which time the majority of counts were made. The patients were kept as quiet as possible preliminary to taking the pulse, and 70 per cent of those not already in bed were sent there for at least fifteen minutes before the count. The smaller percentages were kept seated in chairs.

Our series comprises 185 cases, 103 being primiparæ and 82 being multiparæ. These women were observed for periods varying between 17 and 70 days, as shown by the following table:

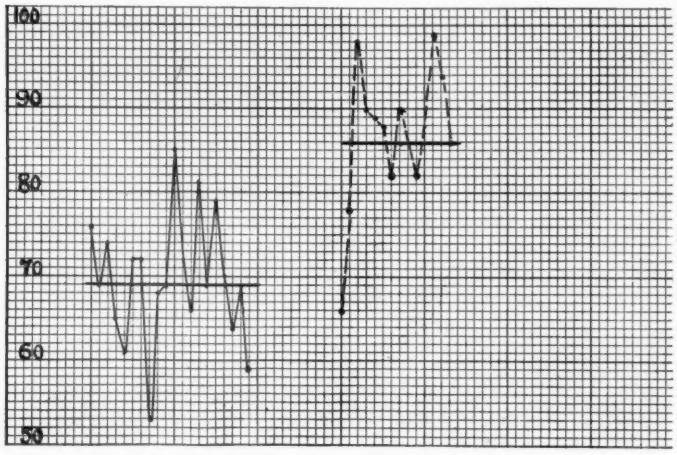
TABLE I

PERIOD OF OBSERVATION

| No. of Days | Primipara No. of Cases | Multipara No. of Cases | Total Cases |
|---|---|---|---|
| 17–20 | 25 | 13 | 38 |
| 20–29 | 30 | 32 | 62 |
| 30–39 | 24 | 22 | 46 |
| 40–49 | 15 | 11 | 26 |
| 50–59 | 4 | 4 | 8 |
| 60–70 | 5 | 0 | 5 |



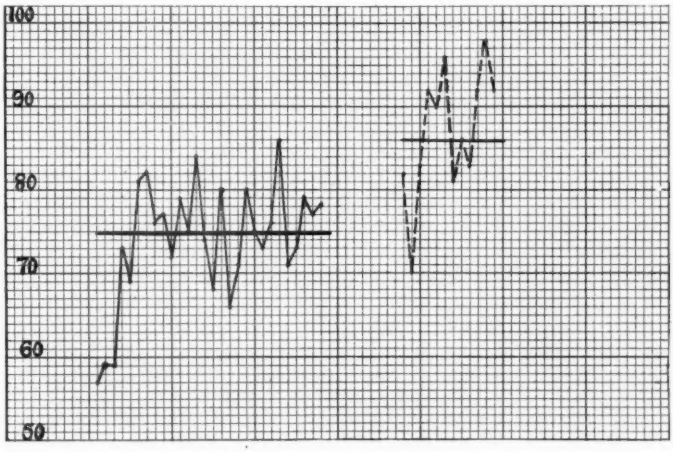

Primipara. Rise of 1 beat



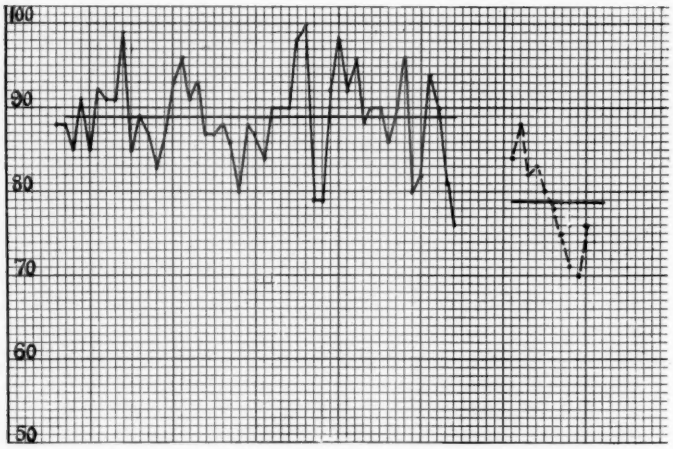

Primipara. Rise of 17 beats.

All cases were considered as units and the pulse records during pregnancy and the puerperium were charted on individual sheets in order to give a clear picture of the record of each patient. The average of the pulses during pregnancy was then taken and contrasted with that of the puerperium on each individual record. No case was admitted to our series in whom the pulse count had been omitted on two successive days of the first eight days of the puerperium. Study of table II shows that the pulse averages during pregnancy were between one and three beats of that of the puerperium in 24 cases. We believe that these should be classified as "pulse unchanged" in order to further limit the errors attending the investigation of a phenomenon as delicate and variable as the pulse rate.

It will be recalled that Heil showed that "a marked slowing" of the pulse occurred in but 12 per cent of his cases. Heil's article primarily controverted the work of older




Primipara. Average rise 11 beats.

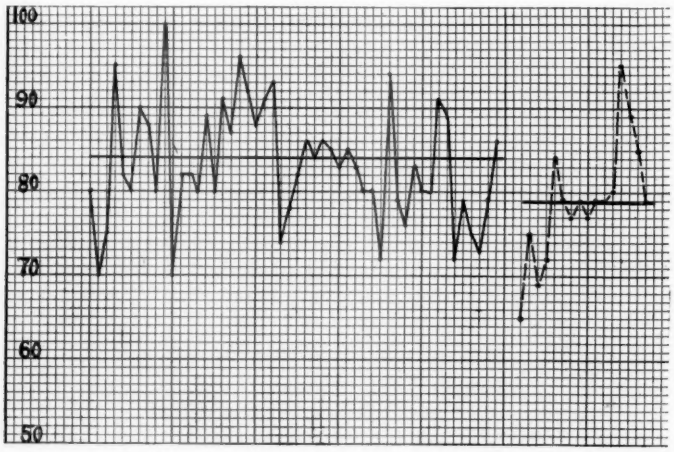



Primipara. 49 days' pregnancy, average pulse 89; 10 days' puerperium, 79.

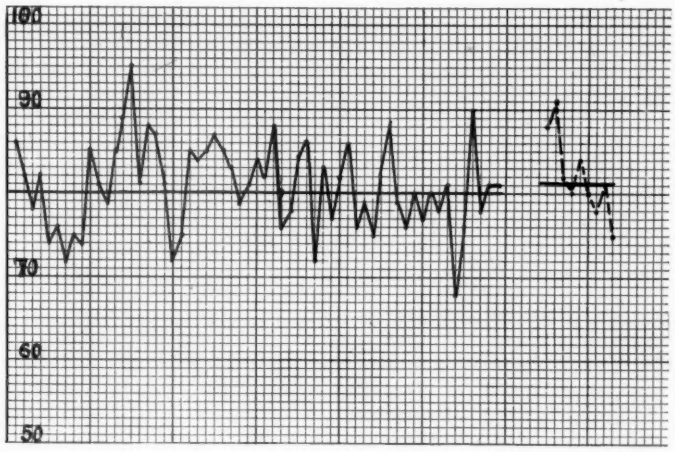
observers, who claimed that "a marked retardation" was to be expected during the puerperium of normal cases, and quite correctly Heil claimed that no case should be considered as an example of "a marked retardation" unless the average pulse rate was at least ten beats slower in the puerperium than in pregnancy. Our table shows that such a fall occurred in 20.5 per cent of our entire series, being observed in 12.7 per cent of the primipara, and 31.7 per cent of the multipara.

TABLE II

| During the Puerperium | Total Series | Primipara | Multipara |
|---|---|---|---|
| Pulse rose | 26 cases (14.1%) | 18 cases (17.5%) | 8 cases (9.8%) |
| Pulse unchanged | 47 cases (25.4%) | 33 cases (32.0%) | 14 cases (17.0%) |
| Pulse fell | 112 cases (60.5%) | 52 cases (50.5%) | 60 cases (72.2%) |
| *Pulse rose* | | | |
| 1– 3 beats | 9 cases | 5 cases | 4 cases |
| 3– 5 beats | 7 cases | 4 cases | 3 cases |
| 6–10 beats | 5 cases | 4 cases | 1 case |
| 11–15 beats | 2 cases | 2 cases | |
| 16–20 beats | 2 cases | 2 cases | |
| 21– beats | 1 case | 1 case | |




Primipara. 51 days' pregnancy, average pulse 84; 16 days' puerperium, 79.



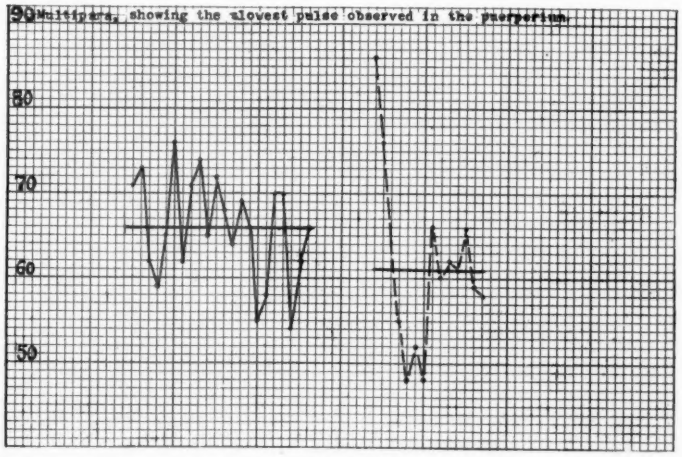

Primipara. 59 days' pregnancy, average pulse 80; 9 days' puerperium, 81.

| | | | |
|---|---|---|---|
| *Pulse fell* | | | |
| 1– 3 beats | 15 cases | 9 cases | 6 cases |
| 4– 5 beats | 13 cases | 7 cases | 6 cases |
| 6–10 beats | 45 cases | 23 cases | 22 cases |
| 11–15 beats | 22 cases | 7 cases | 15 cases |
| 16–20 beats | 12 cases | 6 cases | 6 cases |
| 21–24 beats | 5 cases | 0 cases | 5 cases |

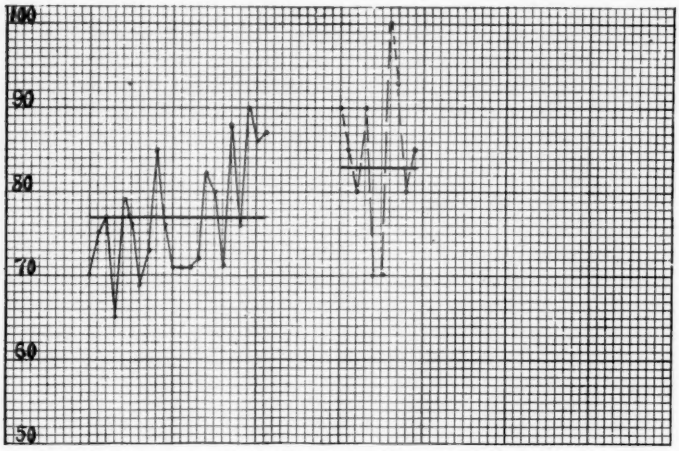
CORRECTED TABLE (SUMMARY)

| | Total Series | Primipara | Multipara |
|---|---|---|---|
| Pulse rose more than 3 beats | ( 9.2%) | (13.6%) | ( 3.6%) |
| Pulse unchanged | (38.3%) | (44.6%) | (30.5%) |
| Pulse fell more than 3 beats | (52.7%) | (41.7%) | (65.9%) |

The slowest pulse observed in any individual during this investigation was 46 to the minute, noted once in a white primipara whose pulse averaged 53 for the three days she was in the hospital prior to labor (counts of 46, 59, 54). She was delivered by a breech extraction under chloroform anæsthesia, and nursed her child. Her pulse averaged 86 for 14 days of the puerperium. The slowest pulse noted in the puerperium was 48, observed twice in a white woman who had borne



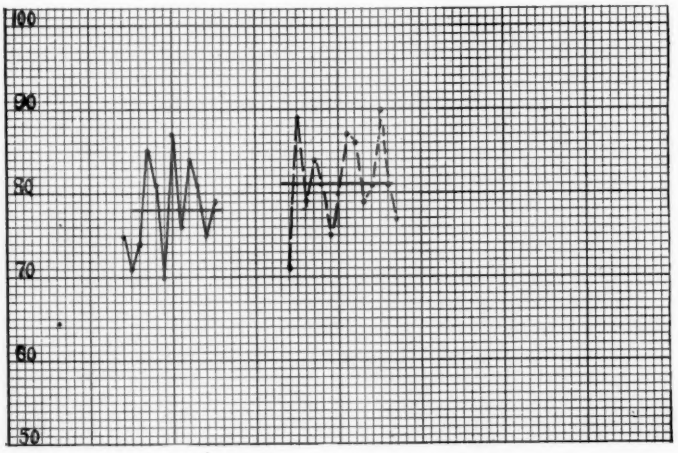

Multipara. Second child. Average of pulse 5 beats slower during puerperium. Average during the last seven days of pregnancy is practically the same as that of both the first and second seven days of puerperium.



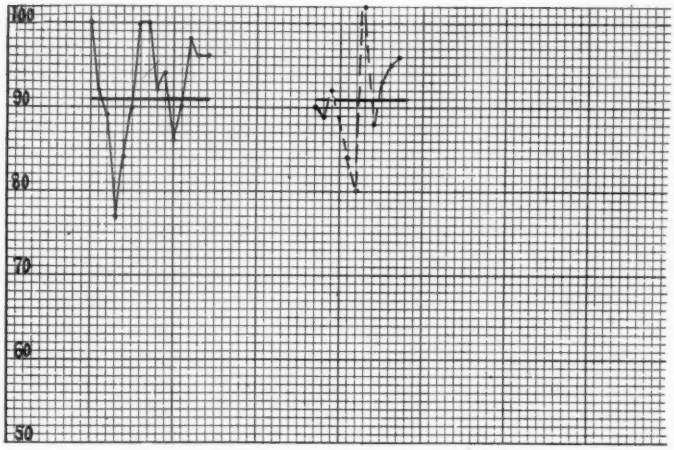

Multipara. Second child. Rise of 6 beats, the highest observed among the multipara.

one child. The average pulse of this case was 66 for 23 days of pregnancy, and 61 for 14 days of the puerperium. (See figure.) Her slowest pulse noted by us in pregnancy was 54, five days prior to labor. The pulse average for the last seven days of pregnancy in this case was 62.5, which closely coincides with that of the puerperium which averaged 61 for both the first and second seven days. It was our habit to confirm the count of any pulse below 55 by the stethoscope, and we found that the heart action was apt to be irregular in the slowest pulses.

The average of the pulses of the 103 primipara was 87 for pregnancy and 71 for the puerperium. The average of the pulses of the 82 multipara was 84 during pregnancy and 76 during the puerperium. This greater variation in the pulse of the primipara constitutes, we believe, one other expression of the more profound reaction of the first pregnancy upon the maternal organism. It is




Multipara. Third child. Average of pulse beats 3 higher during puerperium. Lacerations requiring four sutures healing puerperium.

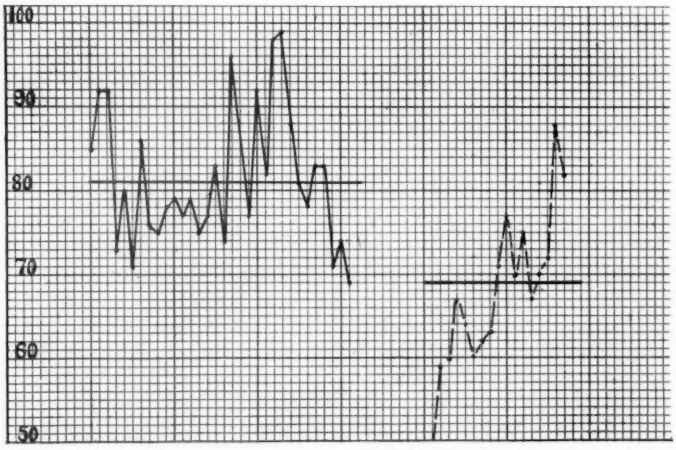



Multipara. Sixth child. Average of pulse unchanged during last 15 days of pregnancy and first 10 days of puerperium.

also a matter of interest that the pulse average in the puerperium became more elevated after the patient was no longer closely confined to bed (8 days) in but a small proportion of cases.

Inasmuch as we have not met with the characteristic curve of the pulse fall as described by Blot, we have not attempted to calculate the day on which the slowest pulses were observed.

Table III is arranged to show the frequency at which various pulse levels were observed in pregnancy and the puerperium. One may calculate from this table that an average pulse rate of 80 or more was observed in 68.1 per cent of all pregnancies combined, and but in 35.1 per cent of the puerperium. Considering the cases as either primipara or multipara, we find that 64 per cent of the primipara had an average of the pulses above 80




Multipara. Eight child. Pulse fall 12 beats. Pulse average while in bed first eight days of puerperium, 60. Thereafter, 74.

during pregnancy, while but 37.8 per cent had similar averages during the puerperium; also, that the corresponding percentages for the multipara were 73.1 in pregnancy, and 35.5 in the puerperium.

TABLE III

Showing the comparative frequency of the same pulse rate in pregnancy and the puerperium.

| Total Series | 185 Cases | | 103 Primipara | | 82 Multipara | |
|---|---|---|---|---|---|---|
| Pulse Rate | Pregnancy | Puerperium | Pregnancy | Puerperium | Pregnancy | Puerperium |
| 51–55 | 1 case | 0 case | 1 case | 0 case | 0 case | 0 case |
| 56–60 | 1 case | 1 case | 1 case | 1 case | 0 case | 0 case |
| 61–65 | 1 case | 11 case | 0 case | 2 cases | 1 case | 9 cases |
| 66–70 | 4 cases | 18 cases | 3 cases | 8 cases | 1 case | 10 cases |
| 71–75 | 17 cases | 35 cases | 12 cases | 17 cases | 5 cases | 18 cases |
| 76–80 | 35 cases | 55 cases | 20 cases | 35 cases | 15 cases | 20 cases |
| 81–85 | 62 cases | 38 cases | 34 cases | 21 cases | 28 cases | 17 cases |
| 86–90 | 41 cases | 14 cases | 20 cases | 9 cases | 21 cases | 5 cases |
| 91 | 23 cases | 13 cases | 12 cases | 10 cases | 11 cases | 3 cases |

Table IV presents the cases of the series grouped in three different classes according to the rate of the pulse average during pregnancy, i. e., pulse average below 80, between 80 and 90, and above 90. It well shows that a woman who has a high pulse average during pregnancy is more apt to have the pulse rate fall in the average during the puerperium than one presenting a slower pulse average during pregnancy.

TABLE IV

Cases with pulse average below 80 during pregnancy.

| Primipara, 37 cases | Multipara, 22 cases |
|---|---|
| 30% rose during puerperium | 22.5% rose during puerperium |
| 37.5% unchanged | 18.4% unchanged |
| 32% fell | 59.1% fell |

Cases with pulse average between 80 and 90 during pregnancy.

| Primipara, 54 cases | Multipara, 49 cases |
|---|---|
| 11.1% rose during puerperium | 6.1% rose during puerperium |
| 29.6% unchanged | 16.3% unchanged |
| 59.3% fell | 77.6% fell during puerperium |

Cases with pulse average above 90 during pregnancy.

| Primipara, 12 cases | Multipara, 11 cases |
|---|---|
| 8.33% rose during puerperium | 0% rose during puerperium |
| 25% unchanged | 18.2% unchanged |
| 66.6% fell | 81.8% fell |

## CONCLUSIONS

It is an extremely difficult matter to present other than general conclusions in a work which presents so large a limit of error as is necessitated by the taking of a pulse but once daily. Yet we believe that the following conclusions may be safely drawn. In our series of 103 primipara and 82 multipara, studied during pregnancy and the puerperium:

1. The average of the pulse in multipara was twice as apt to be slower in the puerperium than to remain at its previous level.

2. The average of the pulse of primipara was quite as likely to remain unchanged.

3. The average of the pulse was three or more beats slower during the puerperium in six of every ten of the women of the series.

4. A fall of ten or more beats was observed in but 20.5 per cent of our total series, yet was found in 31.7 per cent of the multipara and in but 12.7 per cent of the primipara.

5. The more rapid the pulse during pregnancy, the more apt it was to fall; the slower the pulse, the more apt it was to rise.

6. The average pulse rate during the puerperium is not accelerated after the patient leaves her bed on the eighth day in a large percentage.

7. The text-books err in stating that the fall in the pulse rate described by Blot is a usual phenomenon.

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# THE PLACENTAL THEORY OF ECLAMPSIA; FURTHER EXPERIMENTS WITH THE COMPLEMENT FIXATION TEST

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FROM a purely clinical point of view eclampsia is a well defined entity. Its symptomatology is well recognized, although certain less common forms, such as eclampsia without convulsions (1) have been described. The resemblance between the symptoms of eclampsia and of some forms of the toxæmia of pregnancy has led to confusion, and until more specific data, particularly of etiology, are at our disposal, borderline cases may well defy classification. In fact, it is well within the realm of possibility that, when the underlying causes are finally recognized, eclampsia and toxæmia of pregnancy may prove to be but different expressions of the same disease.

In strange contrast to the completeness of our knowledge along clinical lines, the paucity of facts bearing upon the etiology of eclampsia is striking.

Pathology. Schmorl (2) in 1893 pointed out the fact that certain lesions regularly occurred in the liver, and more rarely in the lungs of women who had died of eclampsia. The liver substance is found studded with numerous hæmorrhagic foci, which, when analyzed under the microscope, prove to be composed of small areas of anemic or hæmorrhagic necroses and of capillary thrombi. Other lesions, such as acute parenchymatous degeneration of organs, particularly of the kidneys, cerebral hæmorrhages and areas of softening (probably due to convulsions), are now generally conceded as of secondary importance.

Etiology. As eclampsia appears solely during, or shortly after, pregnancy (immediately postpartum), and as the removal of the products of conception, unless performed too late, usually effects a cure, it seemed justifiable to conclude that the fœtus (3) or the placenta, or both, in some way caused the disease.

Theories dealing with the etiology. The theories proclaimed, and the methods employed by the host of investigators, busied with the elucidation of the problem, accurately mirror the scientific tendencies of the day. At first a chemical poison was sought for, and much weight was adduced to the renal findings. Next morphological studies occupied the foreground, and now that biological investigations are all the rage, every effort is directed along these newer lines. When Ehrlich enunciated his side chain theory this genial conception was eagerly seized, especially by Veit and his school, and upon it they based an elaborate structure,

grounded upon their numerous clinical and experimental investigations. No attempt will be made to review the voluminous literature in detail, as original sources are readily accessible. Most briefly summarized, Veit states that, during pregnancy, minute portions of placental villi are constantly "deported" into the maternal blood stream (4), and are there dissolved by the blood fluids of the mother. The hypothetical solvent he calls a lysin, or more specifically a syncytiolysin. Under ordinary conditions this sequence is physiological, but when an undue quantity of villous fragments is deported into the maternal circulation, the lytic substances no longer suffice to dissolve and neutralize the circulating fœtal cells, which thereupon act upon the maternal structures as an unneutralized toxin, and if present in moderate quantities produce renal irritation (albuminuria), if in more massive dosage, general systematic poisoning (eclampsia). (5)

Experiments dealing with the etiology. Complete experimental proof of Veit's hypothesis would require the demonstration of a specific lysin (6) against placenta. Antibodies are recognized by biological tests (for instance, precipitine, complement divergence). Reproduction of the pathological lesions and of the clinical symptoms of eclampsia would also prove confirmatory. The following paragraphs give a bare outline of some of the immense number of experiments performed by numerous investigators with this aim in view. Scholten and Veit (7) found that serum drawn from rabbits which had been repeatedly injected with an extract of human placenta, agglutinated and partially dissolved a suspension of human placental cells. Liepmann (8) deduced the presence of specific placental antibodies by testing rabbit serum, similarly obtained, against human placental extract, a precipitate resulting. In order to meet the objection that the precipitate indicated merely a general human species reaction, he in another series of experiments removed the precipitate, resulting from the addition of human blood serum, and then obtained a further precipitate with placental extract (partial precipitation). Kawasoye (9) placed human placental cells in the serum of gravid women and obtained a cloudy precipitate and partial dissolution of the cells, which reaction seemed to indicate the presence of a lysin in pregnant women. These experiments all tended to confirm the view that the syncytium acts as a toxin within the maternal organism and that it serves to induce the production of specific antibodies.

Further confirmation was adduced by Veit (7), who noted that when animals were injected, as above described, their urine contained albumen, and that with this albumen a specific placental precipitin could be obtained (Kawasoye (9). Thus another symptom of eclampsia had not only been produced, but also shown to be due to a specifically placental cause.

When finally Weichardt and Piltz (10) and later Freund (11) announced that the injection of placental extracts intravenously, promptly caused the death of rabbits, preceded by severe convulsive seizures, the chain of evidence seemed complete.

Meanwhile, however, doubting voices were heard, and as our knowledge of these biological reactions increased, it became more and more apparent that though a definite species reaction (as for instance human, horse, rabbit, etc.) undoubtedly existed and could be demonstrated by biological tests, organ or cell specificity (as for instance a particular lysin or precipitin for placenta, liver, or kidney cells) became more and more problematic (12).

In May, 1907, one of us (13) immunized rabbits against human placental emulsions (using three different extracts prepared from placenta washed with normal salt solution, with running water, and from a placental nucleo-proteid). With these sera all the tests, previously used isolatedly by other investigators, were performed (precipitation, agglutination, hemolysis, cytolysis against placental cells) upon placental extracts, human blood serum, serum obtained from the cord blood and retroplacental blood, urine from pregnant women, with and without albumen, etc. In addition, the Bordet-Gengou reaction (complement fixation test) was used for the first time in this connection. All the tests uniformly showed that when

any positive reaction was obtained it was a "general human" species reaction, but that not the slightest evidence of a specific placental reaction could be found. The uniformity of these findings, obtained by numerous methods on a large material, added further weight to the voices of doubt previously raised.

[One and one-half years after the appearance of the just mentioned article, Oskar Frankl (Gyn. Rundschau, 1909, iii, h. 3, 111) published an investigation entitled "Zur Frage der Plazentartoxine." After reviewing in a few lines my preliminary communication, which appeared in the Zentralblatt fuer Gyn., 1907, xxxi, No. 15 (R. T. Frank, "Der Effekt der Einverleibung placentarer Bestandteile in Tiere derselben und anderer Species") he dismisses my application of the Bordet-Gengou reaction by stating that "concerning the indispensable controls I find no mention in Frank's German preliminary communication." This in spite of the fact that the complete article, *in which all necessary controls are fully stated, and to which reference is made in the German publication*, appeared only one month later in an easily accessible journal (13). Further on in his paper, Frankl states that "from this it is evident that the complement fixation test has previously never been employed in an unimpeachable (einwandfreier Weise) manner." Frankl's work, however, as far as it applies to this phase of the problem, consists of a series of experiments, in substance identical with those performed by me, and with the same negative outcome. In addition he reports that he employed the Wassermann reaction, using the blood serum of patients as amboceptor and placenta as antigen, but gives no data as to the number of cases or in what months of pregnancy the serum was obtained. R. T. F.]

Schenk (14), quite recently, has again used the complement fixation test with placenta as antigen, and has likewise found no evidence of a specific placental antibody.

The negative results of the investigations, just enumerated, almost sufficed to make untenable Veit's hypothesis that eclampsia is due to a specific placental toxin. One other symptom complex, however, still remained to be accounted for. This was the occurrence of convulsions following intravenous injection of placental extract. It has now been shown to be the result in some instances of coagulation due to foreign body effect (15), and in others to coagulation produced by the fibrin ferment contained in any extract of glands (16), but in no instance due to any indisputably specific toxic action of placenta (17).

Although, as will be seen from this outline, the weight of evidence points strongly against the existence of a placental toxin as the cause of eclampsia, and although at present most workers are directing their energies along different avenues, the question is of such fundamental importance, that we considered it desirable to repeat certain experiments, published by Fieux and Mauriac in February of 1910 (18). These authors claimed to have demonstrated the presence of specific toxic bodies, elaborated by the placenta, and of equally specific antibodies in the blood of pregnant women. Should their contention prove correct, it would not only adduce strong proof favorable to Veit's hypothesis, but would furnish a delicate clinical test, applicable to the detection of pregnancy. They used the Bordet-Gengou reaction (complement fixation), but in a manner different from that previously attempted. It is true that Beauvy and Chirié (19), (whose technique was so imperfect, that it deserves no serious consideration), and Frankl (20), who does not state either the number of cases investigated, or the months of gestation at which the serum was obtained, used the complement fixation test with the mother's serum as amboceptor, but none of them employ very early chorion as antigen. The possibility, therefore, remained, that previous workers had failed because they did not use this modification (21).

To repeat, Fieux and Mauriac, instead of using the serum of rabbits, immunized against human placenta as the amboceptor, as most other investigators had done, employed the blood serum of pregnant women in this rôle, exactly as human serum is used in the Wassermann reaction for lues. As

antigen, moreover, they used extract, prepared from the villi of *early* ova (taking the place of the syphilitic liver of the Wassermann) instead of full term placenta.

Experiments and technique of Fieux and Mauriac. These authors tested the blood serum of 55 women, of whom 34 were pregnant, the others being used as controls. The subjoined table will show the results obtained:

TABLE I

| Number of Cases | Period of Gestation | Abortion | Non-Pregnant | Results | | |
|---|---|---|---|---|---|---|
| | | | | Pos. | Neg. | Doubtful |
| 5 | 20th day to 5th week | | | 0 | 5 | 0 |
| 8 | 2–3 month | | | 8 | 0 | 0 |
| 7 | 3–4 month | | | 1 | 4 | 2 |
| 14 | 4–9 month | | | 0 | 14 | 0 |
| 10 | | | * | 0 | 10 | 0 |
| 10 | | 3 (2–3 month)<br>7 (later months) | | 3 | <br>7 | 0<br>0 |
| 54 | | | | 12 | 40 | 2 |

* But suspected of pregnancy because of amenorrhœa.

Fieux and Mauriac thus account for all but one of their 54 cases. Of this number all but 10 were, or recently had been, pregnant. *Positive reactions were obtained in only 12 cases, all in patients in the second to third month of gestation.* During the first and after the third month, a negative reaction was uniformly noted.

Although minutiæ of technique are not of general interest, the results of the Wassermann reaction depend so largely upon regard to detail, and upon sufficient controls, that it is indispensable to present both the methods of the above French authors and our own.

Details of technique. The antigens or inhibitory extracts used by Fieux and Mauriac were four in number, two six weeks' old chorions, a two months' old chorion, and a placenta of the fourth month. The fresh material was minced, dessicated in vacuo over sulphuric acid, and the resultant powder then dissolved in fifteen parts of normal salt solution. After 24 hours in the refrigerator, the solution, which supposedly contained the antigen, became yellow in color and was ready for use. Of the four antigens the first two were found most favorable, the second allowing only imperfect hemolysis (it evidently was anticomplementary). They believe that chorion of the 6th to 10th week is most favorable.

Except in the description of the source and mode of preparation of the antigen Fieux and Mauriac are vague in detailing the remainder of their technique. They say: "We have followed the technique previously indicated by one of us in a recent article on the Wassermann reaction (le sérodiagnostic de la syphilis. P. Mauriac, Th. Bordeaux, 1909. This article, unfortunately, we were unable to obtain, its absence proving a serious handicap in interpreting their results). No mention is made of controls.

Technique used in the present paper. Antigens. In our work we have tried to follow as closely as possible the methods used by Fieux and Mauriac. Our inhibitory extracts were prepared exactly as above described. They were three in number, and for the sake of convenience will be designated throughout as antigen i, ii, and iii. All were obtained fresh from uteri which were emptied for reasons which necessitated the interruption of pregnancy. Antigen i was prepared from a 6 weeks' chorion. This when dried yielded 1.5 gr. of powder or 22.5 cc. of yellowish solution. Antigen ii was prepared from a ten weeks' chorion, which yielded 8 gm. of a hard brown mass, foul smelling and easily pulverized. The 120 cc. of dark brown fluid obtained on solution, showed a tendency to grow thick, and had a distinctly putrefying odor. Antigen iii was prepared from a 12 weeks' chorion, yielding 15 gm. of powder and 225 cc. of solution, the fluid resembling that of antigen ii.

Titre of antigens. Each antigen was diluted as follows: 0,8; 0,6; 0,4; 0,3; 0,2; 0,1; 0,05; 0,04; 0,03; 0,02; 0,01. It was then tested against a 10 per cent solution of complement (guinea pig's serum) plus a sheep's blood hemolytic system, the contents of each tube being brought to a uniform volume of 5 cc., as in the Wassermann test. Antigen i was not anticomplementary and it was therefore used in a quantity of 0,2 as in the Wassermann test. Antigen ii ceased to bind in a dilution of 0,04; in the tests it was therefore used in a strength of 0,02. As antigen iii no longer inhibited in a strength of 0,02, it was used at a strength of 0,01. Experience has shown that in complement fixation tests it is best, as a matter of precaution, to use only one-half that quantity of antigen, which in the control reactions no longer independently inhibits the complement. For instance, antigen iii inhibited at 0,03 but not at 0,02; consequently in the complete reaction it was used at 0,01. [Citron (22).] Two objections were offered in regard to antigens ii and iii. First, both fluids showed signs of putrefaction, and second, in order to employ them in quantities, safely below their independent anticomplementary action, it was necessary to use weak dilutions, respectively 0,02 and 0,01. As Fieux and Mauriac fail to state their data, no direct comparison can be made. Our antigen i, which corresponded to the most favorable of Fieux and Mauriac's, was irreproachable in these respects.

Sera (or amboceptor). The sera to be examined

were obtained directly from the arm vein of the patient, and, after coagulation, the clear serum was removed from the clot. The serum was inactivated at 56° for thirty minutes, and used in two dilutions as shown in table II. Fresh guinea pig's serum was used as complement in 10 per cent dilution. The hemolytic system consisted of a 5 per cent suspension of sheep's erythrocytes and the proper amount of the serum of rabbits immunized against them. Each reaction necessitated the use of five tubes as will be readily seen in table II. The omitted ingredient was replaced in each instance by one cubic centimeter of normal salt solution in order to bring the volume uniformly to 2 cc. of fluid. One cubic centimeter of 10 per cent complement was then added to each tube, and they were then incubated at 37° C. for one hour. Then 2 cc. of the hemolytic system were added to each tube. Readings were taken, when control tubes 3, 4, and 5 showed complete hemolysis.

TABLE II

| Tube. | 1 cc. Antigen. | 1 cc. Serum. | 1 cc. Complement, 10%. | 37° C. 30 Min. | 1 cc. Sheep's Erythrocytes, 5% Suspension. | 1 cc. Anti-sheep Serum, 1/200. | 37° C. Till Hemolysis of Controls. |
|---|---|---|---|---|---|---|---|
| 1 | 0,2 | 0,2 | " | | " | " | Binding if positive (+) |
| 2 | 0,1 | 0,1 | " | | " | " | Laking if negative (—) |
| 3 | 0 | 0,2 | " | | " | " | Laking |
| 4 | 0,2 | 0 | " | | " | " | " |
| 5 | 0 | 0 | " | | " | " | " |

Result of the tests. In our investigation eighteen sera were examined. Of these nine were obtained from women who were in the second to third month of gestation. The others, also nine in number, were drawn from patients who were in the later months of pregnancy (4th–6th month). *Uniformly negative results were obtained with all sera, with the exception of one which gave a positive reaction with antigen iii, but proved negative with the other two.*

This single exception was noted in the serum of a woman five months pregnant — a later period than that in which Fieux and Mauriac obtained positive reactions. This single positive result impressed us as purely accidental. It seemed possible, though unlikely that, unwittingly, Fieux and Mauriac might have performed a true Wassermann reaction for lues, in that their antigens might have contained luetic inhibitory substances and their sera luetic antibodies. As a matter of interest we therefore also tested the last ten sera against guinea pigs' heart extract. All gave negative results. We also tested antigens i, ii, and iii against six male sera which had given a strongly positive Wassermann reaction. The results, likewise, were negative. These control tests convincingly show that the above mentioned possibility is untenable as regards to the sera we examined against our antigens, but not necessarily so with other sera or other antigens.

Our results and those of Fieux and Mauriac diametrically disagree. It is difficult to explain such a variance. Their positive tests numbered but twelve in a series of forty-four pregnant women, surely a remarkably small proportion of the whole; too few safely to draw such important and far reaching conclusions as they did. The result of our research indicates clearly that this new claim to have demonstrated a placental toxin and a diagnostic test of pregnancy is again fallacious. Its bearing upon the etiology of eclampsia adduces additional evidence, were this needed, against the presence of a placental toxin.

In conclusion, it may prove of interest to refer briefly to some of the most recent investigations. With few exceptions, most workers are trying to explain the eclamptic phenomena by means of ferment action. Dienst (16) believes that in eclampsia the well known hyperleucocytosis of normal pregnancy is exaggerated, and that the attack is inaugurated by a rapid breaking down of leucocytes. In consequence of this destruction large quantities of free fibrin ferment circulate in the vessels of the mother and produce thrombosis, such as is found postmortem. He, therefore, has used hirudin (leech extract) in three cases of eclampsia, as this preparation inhibits coagulation.

Hofbauer (23) regards the placenta as the site of ferments which, under pathological conditions, enter the maternal blood stream, and produce autolytic disintegration of the liver.

Anderson and Rosenau (24), in a small series of experiments, obtained anaphylactic phenomena in guinea pigs by sensitization with slightly "autolized" guinea pigs' placenta and reinjection 22 days later with

similar extract (3 of 6 animals reacted). They believe that eclampsia is probably due to anaphylaxis.

Finally, during the writing of this paper, Sellheim (25) proclaims that, most likely, the mammary glands elaborate the poison to which eclampsia is due, and reports a case in which ablation of these *non-vital* organs cured the disease!

In what further directions the hunt for the cause of eclampsia will lead, remains to be seen. Let us hope that a more critical attitude than that heretofore assumed will be taken in accepting positive findings; for, far more valuable time and effort is consumed in disproving such published results than the advances actually made warrant.

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# THE RELATION OF THE THYROID GLAND TO THE FEMALE GENERATIVE ORGANS

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IN June, 1909, Mrs. P., aged 69, came to the Out-patient Department of the Royal Victoria Hospital, complaining of "pelvic trouble."

She was a tall, slender woman, who looked quite her age. She was extremely nervous and, while relating her history, showed constantly changing patches of erythema, due to vasomotor instability. She stated that she was a married woman and the mother of five living children. She had had two miscarriages antedating her last full term child. Menopause came on at 47 years and had been complete. She had never suffered from any chronic trouble or pelvic disease until within the last two years. Her labors had been easy and recoveries rapid. Two years previous to the date when she came to the hospital she began to suffer from a dull aching pain felt in both lower quadrants. The pain was well localized to the hypogastric region, but at times it would take on an acute exacerbation and would extend to involve the whole abdomen and spread down the thighs. She had lost a great deal in weight, especially during the last six months. Concomitant with, or shortly after the onset of the pelvic trouble she noticed that her neck began to enlarge and she states that it had continued to increase its dimension slowly since then. For the past six months she had suffered a great deal from dyspnœa. During the attacks of general weakness, which came on frequently, the dyspnœa became very troublesome and patient could not undergo any exertion. Latterly, dysphagia had been added to the symptoms and during the last month she had taken nothing solid owing to the discomfort it occasioned. She had grown very weak and could not get about to do her housework.

Physical examination. Omitting all the other symptoms about which there was nothing very striking, we will devote our attention to the pelvis, chest, and thyroid gland.

The thyroid gland was enlarged, uniformly, to nearly the size of an ordinary cocoanut. It rose quite high into the neck and sank into the chest to a considerable depth. It was at this point of contact with the sternum that it seemed to be causing pressure symptoms, for it was almost immovably fixed between the spinal column behind and the sternum in front. There was but little movement imparted by the act of deglutition. There were no differences in consistence detected in palpating the tumor; it was fairly hard and presented a smooth uniform anterior surface.

The glands of the neck were not palpable. The jugular and other cervical veins were widely dilated. The neck above the tumor was pale, that below was of a dusky red due to widely dilated venules. The line of demarcation between these two areas was sharply drawn. It closely resembled the necklace sometimes worn by Indians, namely, a string loosely hanging about the neck from which myriad headed strings depended. Examination of the larynx by Dr. Wm. Jamieson, revealed deviation and compression of the trachea.

The lungs gave evidence of only diminished breath sounds over the whole chest, which was attributed to the diminished respiratory activity due to compression of the trachea. The cardiac condition caused no little anxiety when later it came to a question of operation. She had a dilated irregular heart and all the signs of chronic myocarditis secondary to valvular disease of the mitral. The pulse was always rapid and she had great vasometer instability.

There was an ill-defined mass, palpable over the hypogastrium, deep down in the pelvis. Upon bimanual examination the uterus was found pushed

far forward and solidly fixed. The Douglas's pouch was filled by a hard nodular mass which by its contour and position was definitely intraperitoneal and there were hard nodular masses palpable in the fornices also. Vagina was markedly fusiform owing to senile vaginitis, a condition which always makes the bimanual examination difficult and unsatisfactory.

Such was the history and the condition of the case, which resolved itself into a question of diagnosis. The cervical tumor and the cardiac disease left no question as to their character. But what was the pelvic disease? This was a question which we could not answer. From the woman's age, from the length of time which had elapsed since menopause, from the lack of any signs whatsoever of Neisser infection about the vulva, we brought the diagnosis to two possible conditions — senile salpingitis or malignant disease of the appendages. After exhausting all means to eliminate one of these, it was found to be an impossibility; therefore it was resolved that, though the neck tumor would eventually demand operative interference, yet, if this did not interfere with ether administration, and if the cardiac condition would permit, it would be advisable to operate upon the pelvis first, ascertain its character, and be guided as to the subsequent steps by the character of the disease of the generative organs. Accordingly, the patient was kept in bed for one week to rest the heart and promote the general health.

When the abdomen was opened the disease proved to be chronic pelvic tuberculosis. The tubes were widely dilated with pus and the ovaries were riddled with small abscesses. The adhesions were very dense and one pus tube communicated with the bowel lumen in two places. The uterus and appendages were removed and the bowel sewed up with a double layer of Lembert sutures. The abdominal cavity was drained per vaginam.

The patient made, not an uninterrupted, but a fairly good recovery. Ten days after operation she developed quite a high temperature with pain over the abdominal incision. The stitches were at once removed and a quantity of stinking pus escaped. The aponeurosis held solidly and when the surfaces had granulated the skin was brought together again under gas anæsthesia and union was complete.

Our attention was drawn to the thyroid gland on the twelfth day. It was appreciably smaller. From that time on the symptoms disappeared and the diminution was steady and slow. When the patient left the hospital there was no trace of thyroid gland visible. About the thirtieth day it had reached about normal size, but a still greater reduction took place. It is our impression that she may later suffer from athyrea. Be that as it may, six months after operation she was remarkably well. She developed a considerable bronzing of the skin which at once made one think of a possible adrenal tuberculosis, but it turned out to be only the pigmentation which so frequently supervenes upon total removal of the sexual organs.

Such is the history of this remarkable case. The thyroid gland had enlarged synchronously with the onset and progress of a grave disease of the generative organs, and with the removal of the pelvic disease the goiter visibly diminished to dimensions below the normal.

There can be no doubt that here we have to deal with two diseases which stand to each other in the relation of cause and effect. In which relation do they stand? About this there can also be no doubt. The thyroid enlargement came on insidiously after the pelvic trouble began and the removal of the inflammatory focus in the pelvis caused a spontaneous absorption of the excess thyroid. There can be no hesitation then, in claiming that the pelvic disease was the cause and the thyroid enlargement the effect.

But another question follows closely upon the answer to the former. Which of the pelvic organs is responsible for this action upon the thyroid? To this important question nothing but a tentative answer can be given. To most men the answer will readily come,— that it is due to the ovaries. But if you ask why, the question becomes a very difficult one.

In the hope of finding analogous cases we have searched the literature as far back as 1884 without finding anything that even remotely borders upon one case. But certain known facts lead us to assume that the ovaries are the governing or exciting factor in this hypertrophy of the thyroid. Of recent years, as if stimulated by the monograph of Freund, and by the brilliant results obtained by thyroid therapy, a great deal has appeared in literature bearing upon this relation of the thyroid gland with the genitals. But far back in the history of medicine, the variation in the size of the neck coincident with changes, either physiological or perverted, in certain sexual functions, was well recognized and frequently written about. It is a fact beyond all question that changes in sexual function and activity elicit or demand change in thyroid activity.

To facilitate the exposition of this relation of these two systems, namely, the genital on the one hand, and the ductless glands,

and in particular the thyroid, on the other, we have deemed it advisable to deal with the subject under two headings: (1) The influence of the thyroid function upon the genital system; (2) The influence of the genital functions upon the thyroid activity.

To draw a neutral line between these two divisions of our subject is quite impossible; to wish to establish in each given case the cause and effect is to wish to step beyond what is known of these organs, which are at the present day the subject of so much investigation. There is no system in medicine about which so little is known as that of the ductless glands. There is no system about which there is so much that is speculative and so little that is really beyond the stage of theory. By analogy, yes, by all means of deductive knowledge, we have come to speak of the internal secretion of these glands as if it were a well proven, thoroughly isolated and chemically analyzed humor. Yet when we separate the theoretical from the truly tangible, we find that the tangible *non est.* In spite of this it will be well to approach the subject under the headings as outlined above, knowing that the two may overlap at many points.

Before proceeding to the discussion of the subject in detail we must first inquire into the significance of menstruation and its relation to ovulation. Pinard and others look upon the menstrual flow as the outward sign of ovulation and from this they deduce conclusions which are entirely erroneous if the premise is false. Moreover he has many other authors who agree with him implicitly. He writes of the frequency of incidence of pregnancy during the amenorrhœa of lactation but does not offer an explanation of this phenomenon.

We feel that the relation between ovulation and menstruation is a very loose one. Let us inquire into the relationship more closely. What is it that causes the periodic congestion? To this a positive answer can be given. It is ovarian function. And to be more definite, it is the development of a Graafian follicle. It is the monthly discharge of ovarian function, which is ovulation. Now menstruation is related to ovulation only in this, that the *healthy developed uterus*, at that time will develop a pseudodecidua preparatory to receiving the fecundated ovum, and if impregnation does not take place, the uterine mucosa, under the influence of the pelvic congestion, will bleed by a process of diapedesis or rhexis. If impregnation takes place some time before pelvic congestion has reached its height menstruation will not occur. But, if impregnation takes place *immediately* before the height of pelvic congestion, menstruation will occur, though modified by the time which has elapsed between the fecundation and the menstruation which should not have occurred.

By this we wish to prove that uterine hæmorrhage is but a factor in the reproductive cycle, but it is a factor of a more or less passive nature, and we would go still further and state that uterine hæmorrhage is but an index of retrogressive changes in a special decidual tissue developed for a special cause. When the pregnant ovum does not become implanted upon the specially prepared bed, retrogressive changes ensue and the decidual tissue and hypertrophied mucosa must return to the quiescent intermenstrual state. This retrogressive change is first evidenced by a soddening of the tissues with lymph, weakening of the arterial walls by edema, and finally the vessel walls rupture under the pressure of the blood stream and uterine hæmorrhage ensues. Of this we will have a great deal more to write in another work upon uterine function.

It will be seen then that the uterus is more or less passive. The active agent is the ovary, with its function of ovulation. This function brings about pelvic congestion, and the uterus takes part in the menstrual congestion. Therefore lack of ovulation will mean lack of menstruation because lack of ovulation implies lack of pelvic congestion. But the converse is not necessarily true, that lack of menstruation means lack of pelvic congestion and lack of ovulation. For example, it has been the experience of every general practitioner to have had cases where impregnation took place during the amenorrhœa of lactation. Many cases are also on record of pregnancy before puberty and of pregnancy after

menopause. It is a well known fact that ovulation goes on regularly in children long before puberty. Our sections show that ovulation goes on regularly in infants, yet they do not menstruate. We stated above that normal menstruation is but the index of the influence of pelvic congestion, i. e., ovulation upon a *healthy, developed uterus*, in a healthy individual. If the uterus is infantile or undersized it will not menstruate, or will menstruate irregularly and scantily, and this irregularity is due not to changes in the uterus, which allows it to menstruate some months and not at others, but the irregularity is due to fluctuations in the degree of pelvic congestion. The absence of menstruation under such circumstances does not mean the absence of the chain of uterine changes which are coincident with pelvic congestion. It means the presence of all these but in a minor degree and to a degree that does not permit of rupture of the blood-vessels and hæmorrhage, and necessarily the quantity will be small. On the other hand where the uterus or its mucosa is diseased, where the mucosa is thickened and hypertrophic, the degree of change at the menstrual epoch will be greater, the mucosa will be thicker, and the vessels will be more numerous and the quantity of blood lost will be greater.

Hence, normal uterine hæmorrhage is the index of a normally developed, normally functioning, healthy uterus and uterine mucosa. We are convinced that ovulation and pelvic congestion go on regularly every month from infancy to menopause — and frequently beyond — without interruption, and that uterine hæmorrhage is but a sequence, but not a necessary sequence, and will depend for its absence or for its presence, for its regularity and for its irregularity, for its scantiness and for its excess, upon conditions quite apart from ovulation. These determining conditions may be uterine or extrauterine, and we need not stop to inquire into these. Our readers will note that we did *not* state that "the characters of the menstrual flow will depend upon conditions quite apart from *ovulation and pelvic congestion*," but we did state that the characters will depend upon conditions quite apart from *ovulation*. It will be readily seen that the character of the pelvic congestion will be quite independent of ovulation — the cause which provoked it. Many factors may enter to increase or decrease the determination of blood to the pelvis. But these are independent of ovulation, and may best be spoken of as complications. Such, for example, are pelvic inflammations, ectopic gestation, cardiac disease, and new growths.

From the foregoing it will be seen what a very fluctuating sign menstruation really is; how it is acted upon by so many extrinsic causes, not only as to its periodic regularity, but also as to its quality. Its vasomotor system seems to be no less under the dominance of the higher nervous centers than is the vasomotor system of other organs. The vasomotor changes which find their expression in spells of fainting which follow upon great mental shocks, find their analogue in the amenorrhœa in great nervous shocks. Moreover it has been the experience of every gynecologist and obstetrician to find the recurring pains of menstrual dysmenorrhœa of young girls cease suddenly for a while when the physician enters, and the same expression of nervous influence is seen in the cessation of uterine labor pains when the accoucheur arrives.

From this it must follow that changes in menstruation as to regularity and quantity must be interpreted with the greatest care especially in a work of this nature in which we wish to bring two systems into close relation, and endeavor to trace a cause in the one system, if such there be, to explain an effect in the other.

### THE INFLUENCE OF THE THYROID UPON THE GENITAL SYSTEM

Of perversions of the thyroid activity we recognize two well defined types: excessive thyroid secretion, of which we have the classical type in exophthalmic goiter, and defective thyroid secretion as the type of which we recognize myxœdema. But it is not these pronounced cases which are of the greatest clinical interest. There is absolutely no reason why cases should conform closely to these two types to fall into these same categories. The French school were early in rec-

ognizing the larval stages of these two diseases, which Charcot speaks of as "les formes frustes." Just as the classical cases of these two types are easy to diagnosticate, so are the larval types correspondingly difficult of recognition. Yet it is just in these cases that brilliant therapeutic results can be expected. Thyroid secretion has been known for ages to exercise a profound influence over the female genitals. Long before Freund's monograph folklore associated the two, but it was reserved to Freund to crystallize the subject. Since then a great advance has been made in the therapy of these diseases by the use of thyroid gland extract, so that a great increase in our knowledge has taken place.

In view of this assistance due to thyroid therapy, which finds its most brilliant result in the cases of hypothyroidism, we have deemed it proper to begin with, *the influence of diminished thyroid secretion upon the genital system.*

Perhaps the most striking example of this relation is found in cretinism. Cretins, who live to reach the age of adolescence, invariably suffer in the development of their sexual organs. The external genitalia remain infantile and the uterus remains small and undeveloped. Sexual appetite is nearly always absent and procreation is an impossibility.

But a more interesting symptomatology obtains in cases of myxœdema. Myxœdema is much more common in women than in men. The ratio is as seven to one respectively. Yet the great age for its development is between 35 and 50. In cases of myxœdema beginning at this age the sexual organs are fully developed before the onset of symptoms of hypothyroidism and any changes which supervene may be directly attributed to the defective thyroid secretion. In one case reported by Bramwell menstruation was undisturbed. In others the menstrual flow was greatly increased leading to grave anemia, and under thyroid treatment the unnatural hæmorrhages returned to the normal flow.

But by far the most common symptom is amenorrhœa. It is a fact beyond refutation that in the cases of menorrhagia associated with slighter grades of myxœdema there is always a cause other than hypothyroidism to account for the excessive hæmorrhage. The association of perverted calcium metabolism with thyroid perversion is well known. If we examine carefully in these cases of menorrhagia we find a great diminution of coagulability of the blood, and the administration of small doses of calcium lactate often effects a speedy cessation of this symptom. In spite of this the hypothyroidism goes on and the diminution in the calcium content will shortly make itself felt again in the renewal of the unnatural hæmorrhages. Under such circumstances the administration of both calcium and thyroid will effect a return to the normal provided the pelvic organs are healthy. Amenorrhœa is by far the most common pelvic symptom and it is a well established fact that once myxœdema is established pregnancy seldom supervenes. Moreover, cases of amenorrhœa in myxœdema soon recover their normal menstrual flow with a subsidence of the symptoms of the primary disease.

But, as stated above, it is not in the pronounced myxœdematous cases that we find the most interesting results. Some of our clinical experiences are infinitely more instructive. Let us revert to these.

In 1905, Mary H. came under observation in the Out-patient Department of the Royal Victoria Hospital. She was 18 years of age, short, stout, and plethoric. Her voice was distinctly nasal and harsh; she had large tonsils and adenoids, and hearing was impaired. She presented a drowsy appearance, accentuated by heavy eyelids. She came complaining of amenorrhœa. She had menstruated regularly for six months between her 14th and 15th year but since then only about once in a year, usually during the warm months. Physical examination revealed nothing striking. The hymen was intact but the aperture was large enough to admit the finger. The uterus was normal in size and the pelvis healthy. The thyroid gland could not be felt. She suffered much from constipation. She was put on ovarian extract and pill Blaud, which she continued for a very long time without any appreciable change, except that the flushes and headaches which appeared monthly were greatly increased in severity. She disappeared for two years. Upon her return she again complained of the amenorrhœa which still persisted. She was put upon small doses of thyroid extract (two grains t. i. d.) and her menstruation came on one month later and has been regular since that time. She returned regularly for six months for the renewal of her prescription. She then remained away for seven months and came complaining of pelvic pain.

The sexual appetite must have become overpowering for she had substituted a gonorrhœal double salpingo-oöphoritis for her amenorrhœa.

About one year ago Alphonsine D. came complaining of epileptic fits which came on regularly every month. She stated that she had long periods of amenorrhœa and that when she should have her menstruation she had all the molimina very pronounced,— headache, flushes, congestion of face and head, swollen hands and restlessness. This would last about two days and culminate in an epileptic seizure. At other times she would experience all the foregoing symptoms but menstruation would come on, though scanty and the epileptic seizure would be absent. Her condition was pitiable in the extreme. She lived in constant dread of the monthly attacks and she begged that something might be done for her. She had menstruated regularly for a very short time. She had taken so much bromides that she was dull and heavy and covered with the rash of bromism. Nothing abnormal was found on examination so far as the pelvis was concerned. The thyroid showed no appreciable change. The skin and subcutaneous tissues seemed normal; but mentation was slow and speech equally so; she was somnolent and very apathetic except when spoken to, when she would rouse herself. She was put on small doses of thyroid and general tonic treatment. The change was astounding. Within six weeks menstruation returned, and that patient is one of the happiest and most grateful cases one could wish to see.

A short time afterwards a similar case came to the clinic. There were "epileptic attacks" which made their appearance every month in a young girl, who suffered from intermittent amenorrhœa. The pelvis was healthy. She was at once referred to the clinic for nervous diseases and Dr. C. K. Russel examined the case thoroughly. It was a parallel case with a great improvement in her symptoms, though she occasionally has a seizure.

Five months ago a very stout young Jewess came under observation. She weighed 210 pounds, was very flabby and pale, had a voracious appetite, which she gratified upon every occasion and suffered from symptoms of hyperacidity. Her chief complaint was menorrhagia. She would bleed for twelve days in very large quantities, and for the last three months she had never been free from hæmorrhage. She had been curetted three times by a special surgeon. She had been married seven years and had had no pregnancies. She was stout when she married, weighed 180 pounds then, but has steadily gained since. Her menstruation was always copious. She was put upon thyroid extract, three grains after meals, and calcium lactate. She at once began to lose weight and hæmorrhage ceased. The next menstruation, which came on two weeks after treatment was begun, lasted only eight days and was much less in amount. She lost thirty pounds in the next three months and menstruation has been less in amount than at any time in her sexual life.

We have at the present time two cases of larval thyroid deficiency, and quote both cases inasmuch as their menstrual histories are so opposite. One was a woman of 45 years, mother of seven children. She came to the Royal Victoria Hospital about four months ago complaining of metrorrhagia. She had a mass the size of an orange in the right fornix and a large tender uterus. She was very pale, had bled a very great deal, and the vagina had been packed several times before coming to the hospital. The diagnosis of ectopic gestation was made, but she was not in a fit state to undergo an abdominal section. So in view of the fact that the uterine hæmorrhage was quite uncontrollable the uterus was gently curetted and packed with gauze. The hæmorrhage ceased immediately. She was told that laparotomy would be necessary at a later date, but the mass diminished quickly in the course of the next two weeks, and she refused operation. A short time ago she returned complaining of such severe hæmorrhage at menstruation that she feared she would die. The blood examination gave 60 per cent of hæmoglobin, 3,000,000 red cells and 6,300 leucocytes. There was a small mass palpable over the right appendages, and the uterus was large and fixed. Assuming that this was a well marked case of chronic metritis with the remains of the ectopic, hysterectomy and right salpingo-oöphorectomy were done. The right tube was filled with old blood and the left was normal. The adhesions about the former were dense. The uterus instead of being fibrous was soft and muscular, and when opened the vessels did not stand out as they do upon the cut surface of a case of chronic metritis. The mucosa was healthy. Before operation a slight grade of myxœdema was suspected owing to puffiness of the eyelids and the general appearance of the face. The nails were brittle, and she had become bloated during the last year in spite of the hæmorrhages. In fact she presented the appearance that would at once rouse suspicions of chronic nephritis. She was put on nine grains of thyroid daily, and her whole facial expression has changed. The operation was a very bloody one owing to the low index of blood coagulability, every raw surface bled profusely, a thin, very liquid, pale red blood. We are firmly convinced that this again is another one of these cases which was most favorable for combining calcium lactate and thyroid treatment, and we feel equally certain that had this treatment been instituted early operative interference would not have been necessary.

The second case is that of a woman of 30 years. She had had three children, the youngest being five years. Menstruation had never been quite regular. She was a strong athletic girl. Five years ago, after the birth of her last child, she began to suffer from amenorrhœa. Menstruation would recur at long intervals. Periods of amenorrhœa of three, four, and six months would come on. Menstrua-

tion was very scanty. Headaches have been extremely severe at the time when menstruation should come on, and her skin and nails are very dry. There is marked general pruritis. At first there was somnolence with increase in weight, but of late there has been insomnia with loss of weight. Two years ago she had five "epileptic seizures" at five different periods when menstruation should have come on but did not do so. The thyroid is not palpable. She has not been pregnant during the last five years. She has improved remarkably under thyroid treatment. Menstruation has become regular and patient is not nearly so nervous nor so dull mentally. Premonitions of impending troubles made her life miserable. These have totally disappeared.

This patient's only sister has never menstruated regularly. She has long periods of amenorrhœa, and she weighs 180 pounds although only 21 years of age. Thyroid treatment was begun just a few days ago, so we cannot as yet speak of the effect.

These two cases suffice to show how profoundly the sexual function may be disturbed through insufficiency of thyroid secretion. Further consideration of this relation may better be reserved until we have dealt with:

### THE INFLUENCE OF HYPERTHYROIDISM UPON THE SEXUAL FUNCTION

Of excessive thyroid secretion we must recognize two types, which are really one and the same disease but differing only in degree. The typical case of an exophthalmic goiter is easy of recognition, but many cases exist in which the cardinal symptoms are absent but the secondary symptoms are much to the fore. These cases are difficult of diagnosis. Elliot has drawn attention to the importance of these cases. Let us quote from this author: "The frequency of occurrence of morbid overactivity of the thyroid gland is probably much greater than is generally believed; for, with the present better appreciation of the nature of thyroid intoxication, many cases are being thus interpreted that in other times were probably passed over as instances of neurasthenia, hysteria, functional heart disease, and anemia."

The influence of hyperthyroidism in producing sexual change has been known for many centuries, but it was not until 1859 that Charcot brought the knowledge of the day into a logical and tangible form in his articles of 1859 and 1862. He brought into prominence the close dependence of menstruation and ovulation upon normal thyroid secretion. Aran, in 1865, in a paper before the "Academie de Medicine" laid great stress upon the influence of hyperthyroidism in producing disturbances of menstruation, chiefly suppression, and in this address he outlines his treatment by stating that every means ought to be adopted to bring about a congestion of the uterus and thereby re-establish the suppressed menses. Of course Charcot and Aran assumed that lack of menstruation was the index which pointed to the uterus as being the organ which stood in close relation with thyroid function. But to-day we know that menstruation is but the outward sign of ovulation.

The change in function of the uterus is not always the same in hyperthroidism, just as we pointed out under hypothyroidism. In one case we find amenorrhœa, in another menorrhagia. Alvarez has drawn attention to this change in a recent paper upon the frequency of hyperthyroidism in Mexico. But the most interesting communication has been that of Pinard, who gives the histories of several cases, which, owing to their great interest, we have thought worthy of being copied rather fully:

Case 1. Exophthalmia at puberty: Improvement of the exophthalmia when menstruation became regularly established; further improvement during first pregnancy. Three years later return of exophthalmic goiter, coincident with amenorrhœa; improvement set in as soon as menstruation returned.

Case 2. Irregular and delayed menstruation, coincident with onset of exophthalmic goiter. She would have periods of amenorrhœa of several months duration, and when menses came on it was always very scanty.

Case 3. Amenorrhœa coincident with symptoms of exophthalmic goiter and improvement and final disappearance of all symptoms coincident with return of normal menstruation.

Case 4. Coincident amenorrhœa and symptoms of exophthalmos.

Case 5. Amenorrhœa followed by appearance of typical exophthalmic goiter. Menstruation returned later and with the setting in of the ovarian function symptoms of goiter began to disappear.

A sister had synchronous onset of menorrhagia and exophthalmos. Improvement of latter came on with improvement in the former.

Case 6. Synchronous onset of gradually delayed menstruation followed by complete suppression with gradually increasing symptoms of exoph-

thalmic goiter. Reappearance of menstruation coincident with complete relief from goiter symptoms.

CASE 7. Irregular menstruation with complete suppression at the same time that symptoms of hyperthyroidism occurred. After six months of treatment return of menses and complete disappearance of symptoms.

CASE 8. Increase in size and weight coincident with suppressed menses and onset of exophthalmic goiter. Eighty-eight days after onset of treatment reappearance of menstruation, disappearance of goitrous symptoms and a loss of fourteen pounds.

CASE 9. Woman of 48; onset of amenorrhœa with flushes, dizziness, weakness, increase of weight, insomnia, and all the nervous symptoms of the menopause, together with all the cardinal symptoms of exophthalmic goiter. Menstruation did not return, but under treatment all the symptoms of exophthalmos disappeared.

We have purposely quoted these cases in this category as showing the influence of the thyroid over the function of ovulation and of menstruation. But with equal justice one might contend that it is defective ovarian function and its consequent absence of uterine function which causes the overactivity of the thyroid. And this latter view is just the one that Pinard takes as being the probably correct one. He quotes Trousseau as follows: "There is therefore another morbid symptom which deserves special mention, the *suppression of the menses*. In fact, all the women who are the subjects of Graves' disease give a history of menstrual disturbance. At first the menstrual flow is irregular and later ceases altogether, and when it is re-established the patients seem to take on improvement, whereas on the other hand they nearly always experience an exacerbation of the goitrous symptoms at the periods when menstruation should have made its appearance." . . . "I therefore had good reason not to consider the amenorrhœa as a phenomenon of secondary importance. On the contrary I am tempted to accord it a prominent place as a factor in the etiology, course, and duration of the exophthalmic goiter." Pinard, commenting upon these lines, writes: "Judging from this extract, it seems to me that once again Trousseau has shown himself a great clinician."

From the foregoing it must not be assumed that the amenorrhœa is a necessary concomitant of exophthalmic goiter. Two cases within our experience did not give any history of any derangement whatsoever of their sexual function, and Elliot and Alvarez quote cases that were also unaffected as to their menstruation. Albutt also states that menstruation may be unaffected, and Bramwell and Elliot refer to some in which menorrhagia was a feature.

### THE INFLUENCE OF SEXUAL FUNCTION UPON THYROID ACTIVITY

This again may be readily subdivided into two groups, namely: (1) The influence of lessened sexual function and (2) the influence of increased sexual function upon thyroid secretion.

To preserve a correspondence with the foregoing order it will be well to begin with *the influence of lessened sexual function upon thyroid secretion*. It is a well known fact that exophthalmic goiter is a disease of the sexual age. Cases are rare indeed which show the symptoms before 15 years of age. On the other hand myxœdema is a disease of infancy and early childhood as well as of the decade between 35 and 45 years. Let us quote from Osler: "Most cases of exophthalmic goiter occur between the ages of 16 and 40. The proportion of women to men is 8 to 1. Cases in children are rare. After 50 the incidence in general is rare, and men then are relatively more often affected." Albutt writes: "Whilst the disease may arrive at any age, it is chiefly between puberty and menopause that it occurs. I have not observed a case in a patient under twelve." But on the other hand cretinism and myxœdema are diseases prone to occur before and after the menstrual life. More than half the total cases of myxœdema occur in women between 40 and 45 years of age. And cretinism is a disease of childhood. These factors taken into consideration, we must assume that the absence of ovarian and menstrual function is a strong predisposing factor in the production of myxœdema. Multiparity is a strong predisposing factor, and we argue from this that the physiological hypertrophy of the thyroid with each pregnancy and its subsequent involution post partum, causes an in-

stability of the gland function which is in consequence prone to pass over into pathological states. But to this we will have occasion to return later.

That the arrest of menstruation at menopause is very frequently followed by the so-called nervous phenomena of the climacterium is well known to every student of medicine. But it is only lately that these symptoms have been referred to a loss of balance among the ductless glands owing to the withdrawal of the ovarian influence. In chosen cases brilliant results have been achieved by the exhibition of small doses of thyroid extract. The dose must be very small inasmuch as these patients react very promptly. Such has been the experience of Alvarez and others. It may be objected that many, yes, most of these symptoms of menopause are those of exophthalmic goiter and not those of myxœdema. That, indeed, is true, but it is singular how some cases present combination symptoms, and these are the hardest to diagnosticate. "It is entirely probable," writes Alvarez, "that the thyroid secretion is composed of various elements, and that some may be diminished or absent, whilst others are normal or overactive. This can help to explain those cases in which hyperthyroidism and hypothyroidism are plainly present at the same time." Pittfield suggests that the thyroid secretion may be almost as complete as the blood plasma and its different functions. In our experience very small doses of thyroid have very effectually relieved the symptoms of artificial menopause brought about by complete removal of the pelvic organs. Moreover the marked obesity which so frequently comes on after castration can be controlled in the majority of cases with very great ease by the careful administration of thyroid. This is strong therapeutic proof that castration is followed in a large percentage of cases by symptoms of lessened thyroid activity. And lastly, we would call attention to the marked amelioration which pregnancy calls forth in patients suffering from exophthalmic goiter. In such cases the arrest of menstruation and lactation seems to make a lessened demand upon the thyroid gland and a consequent lessened secretion, or perhaps a more scientific explanation is that during pregnancy, as we will see later, more thyroid secretion is needed in the economy owing to the rapid cell division in and increased metabolism of the fœtus. Hence there is less superfluous thyroid secretion to exercise its baneful influence upon the maternal tissues.

*The influence of increased sexual function upon thyroid activity.* The types of cases which illustrate this fact are so numerous that it will be quite impossible to deal with the subject fully without lengthening this paper unduly. It will suffice for our purpose to point out some of the main types to demonstrate what a potent factor increased sexuality is in eliciting increased function of the thyroid. It is a common occurrence to find increase in the size of the thyroid gland with the onset of puberty, and in a large number of cases the gland increases with each menstrual epoch. With this there may be tremors and some of the primary or secondary symptoms of exophthalmic goiter. Pregnancy is a potent factor in causing enlargement of the thyroid. Freund noted this in 45 of 50 pregnant women, and Lange found enlargement in 108 of 133 cases examined. Occasionally, as pointed out by Elliot, this physiological stimulation may be the starting point of a genuine Graves' disease, or, on the other hand, the subsequent involution may proceed to a pathological degree and end in a genuine myxœdema. He ends by stating that rapidly repeated pregnancies with their attendant lactations, by causing hypertrophy and subsequent involution — gland instability — are particularly hazardous to the welfare of the gland.

There are other factors of a sexual nature which profoundly affect the thyroid gland. We have had quite within recent date two cases in which abnormally frequent sexual relations, continued over a very long period, had produced remarkable widespread pathological changes. The one was the young wife of a robust virile blacksmith. It was a common thing for sexual intercourse to take place eight and ten times daily. Menstrual periods caused little difference in their habits. They had been married six months when I was

called to treat her for backache, nervousness, and general lassitude. She complained that her neck had grown quite large in the last two months. She had tremor and tachycardia. The uterus was almost twice the normal size, soft, very congested, and the cervix was as soft as that of an early pregnancy. The ovaries were readily palpable, large, tender, and freely movable. The thyroid was quite perceptibly enlarged. A general tonic was given and the young woman advised to go away for a month. Upon her return the whole condition had changed. The thyroid had assumed its normal dimensions and the pelvic organs were greatly reduced in size and were firmer and less tender. A second case, very similar in history, responded equally well. We think that there can be little or no doubt that in these cases constant or rapidly occurring periods of congestion of the ovaries called forth the increase in size of the thyroid.

It is a common thing in chronic inflammatory disease of the uterine appendages, especially of the tuberculous type, to find markedly increased sexual desires. In three cases of fairly recent date the exaggerated symptoms amounted to nymphomania. In all these cases the condition was advanced tuberculosis. We write the above to show that chronic destructive lesions like those of tuberculosis, even where the ovaries are converted into pus sacs, do not necessarily mean loss of ovarian secretion. If complete ovariotomy removes sexual desire, we think we are justified in assuming that this is due to withdrawal of the ovarian secretion and equally justified in assuming that abnormally increased sexual appetite must be a result of ovarian hyperactivity. It does not follow that under such diseased conditions this hypersecretion is simply a normal secretion in excessive quantity. It may be perverted but it is nevertheless an ovarian activity. That is just what we wish to prove in our case cited at the beginning of this article. The diseased appendages must have thrown an increased ovarian secretion into the circulation which called forth an increasing demand for thyroid activity.

It would seem, under these circumstances, these two ductless glands, the ovary and the thyroid, stand in their relation, not as compensators but as neutralizers. And that that is the case throughout the sexual life of a woman is evident from the whole of the contents of this paper. We see enlargement of the thyroid take place at puberty where ovarian activity takes on such importance as to change the whole character and conformation of the body of a girl; we see increased thyroid activity — at least enlargement of the thyroid gland — coincident with sexual relations. The same change occurs with pregnancy, and in many cases signs of increased activity of the thyroid with each menstrual flow. Then again we find this statement, that these glands act as neutralizers and not as supplementers, substantiated by the lessening of the thyroid activity coincident with lessened ovarian function. For example, myxœdema and infantilism and cretinism are prone to develop in the ages when the ovaries have not as yet taken on active function, or have ceased to functionate. We have seen that infantilism and cretinism develop before the age of 15, and two-thirds of myxœdematous cases develop between 40 and 45 years of age. Moreover in many of these cases there is a tendency to early menopause. This is the first time, so far as we can ascertain, that this antagonism of two internal secretions has been pointed out. We mean antagonism in the clinical and not in the chemical or biological sense. That the overactivity of the ovarian secretion, whether chemically normal or chemically perverted, calls forth a greater thyroid activity to neutralize its affects seems forced upon us. It is possible, as Pittfield points out, that the thyroid secretion is a very complex body, as complex as the blood plasm. This readily explains cases like our own where ovarian irritation and congestion cause a marked overactivity of the ovaries and a corresponding increase in thyroid activity is demanded to neutralize the excessive secretion from the pelvic organs. But it does not necessarily follow that the complex thyroid secretion is wholly neutralized. Some of its compounds may remain over to exercise their injurious effects upon metabolism. That this is the case

is shown in those cases which evince signs both of hypo- and hyperthyroidism, —a deficiency in some ingredients and an excess in others. It is not imperative, not even probable, that it is the same ingredient, the absence of which brings about the symptoms of myxœdematous cases and the excess of which causes those of exophthalmic goiter.

The whole subject is one that is still clouded. There are so many factors which enter to disturb the blanace that to be dogmatic is to be in error. In the first place, the interpretation of plus or minus ovarian activity by absence or regularity of menstruation, or by plus or minus sexual appetite, is of course completely unjustifiable. Moreover the chain which unites all the ductless glands is so complete, that to reckon with any two leaving the others out of account is equally unjustifiable. Moreover the pituitary and parathyroid functions seem so closely allied with that of true thyroid function that they too enter to add their quota of complicating factors. Cushing has drawn attention to the close relation of the ductless glands in the following sentence from his oration on surgery at the last meeting of the American Medical Association, "It is impossible to remove, — probably partially to remove — the hypophysis or any other gland, without producing marked alterations in all the other glands, thyroid, parathyroid, adrenal, testicles, ovaries, islands of Langerhans, and thymus." We therefore must look beyond the individual cases to view the whole subject broadly.

Generally speaking, exophthalmic goiter is a disease which almost invariably makes itself manifest during the years of greatest sexual activity. This is a matter beyond dispute. Equally true is it that myxœdema together with its allied disease cretinism is decidedly a disease which manifests itself before or after the sexual life. In this we have the strongest argument in favor of our contention that these two glands are either under the same governing center or that they depress and stimulate each other into activity. Moreover, we know the influence of pregnancy in causing amelioration of exophthalmic symptoms and in causing aggravation of the symptoms of myxœdema in those who are already deficient in thyroid secretion, or in causing the symptoms of myxœdema to appear in those who have no reserve thyroid force. Those who are au fait in the histology of the ovary know that during pregnancy not only is the corpus luteum frequently of huge dimensions (always larger than the corpus of menstruation) but there is development of lutein cells in all the other unruptured only partially matured Graafian follicles, together with increased secretory signs in all the interstitial cells of the ovary. It is this increased activity of the ovarian secretory structures — though necessary for the pregnant state — which demands an increase in thyroid activity to offset some of its products which are injurious to normal metabolism. A great deal has yet to be learned about the function of the ovary and about the structures in the ovary, which are the seat of its special function of internal secretion.

The French school of investigators, who have worked upon this question, foremost among whom are Villemin, Bouin, and Ancel, Cohn, Frankel, and Limon, have shown that there are two secreting structures in the ovary. These are, firstly, the corpus luteum, which has a function in relation to pregnancy, and secondly, the interstitial cells of the ovary. The former is periodical and elaborated for a special function, the latter varies not so much, is more uniform in its secretion and of longer life than the sexual life of a woman. Dr. Goodall in his researches has had many opportunities in which to corroborate the findings of these authors. If we stain a section of the ovary with hæmatoxylin and Sudan III we find fat cells, resembling in every particular the fat cells of the corpus luteum scattered throughout the ovarian stroma. These are the constant internal secretors of the ovary. After rupture of the Graafian follicle another special secretory surface is developed, the corpus luteum, which in the menstrual phase, comes quickly to maturity and quickly atrophies. But in pregnancy it goes on developing to sometimes huge dimensions. The special function of this body seems to be to prepare the bed for the impregnated ovum in the uterus. In the ovaries of a pregnant woman we find that not

only has she built up a large corpus luteum but in addition in order to meet the demands made upon the ovary every other Graafian follicle develops a large ring of lutein cells about it, and in addition the interstitial cells also have increased their function.

As to the chemical properties of these two secretions we know next to nothing except that they stain with Sudan III and are probably very complex fats.

Now it will be readily seen that the internal secretion of the ovary which most influences the thyroid will be the secretion from the interstitial cells. Frequently repeated intercourse will not cause ova to ripen at irregular periods, for, if it did so, we might expect very irregular menstruation. But intercourse, by causing frequent repeated congestions of the pelvic organs does increase the interstitial secretion and hence thyroid hyperactivity follows. Any chronic inflammatory pelvic disease may act in the same way. The symptoms elicited by greater thyroid demands at menstruation are due to the same congestive cause acting upon the interstitial tissue. The corpus luteum on the other hand has its own special uterine function to perform.

Parrhon and Goldstein have tried to align these two organs, i. e., the ovary and thyroid, and leaving the other ductless glands completely out of consideration, have deduced conclusions which affect nearly every organ of the body. Unfortunately the subject is not so simple and their conclusions are frequently based upon the flimsiest and often misinterpreted clinical and experimental evidence.

It is not our wish to give the impression that we are dealing with the thyroid in direct relation with the genitals or vice versa, for we are awake to the fact that to deal with the subject in this manner would be the greatest mistake possible. But out of the tangle we have tried to unravel a little to show that these two structures are interdependent, but not once have we lost from sight the influence of the other ductless glands and the possible sources of error arising from the interaction of these.

To further accentuate the close relation of the sexual organs with the thyroid let us quote a few lines from a recent text-book upon biology by Gaskell. After stating that the thyroid in the scorpion and other animals empties its secretion into the uterine cavity he continues: "What the function of these cells (thyroid) is I am unable to say. I can only suppose that the reason why the thyroid has persisted throughout the vertebrate kingdom after the secretory organs have found a new outlet for their products in the body cavity of the posterior region, is because it possessed some important function in addition to that connected with the exit of the products of the generative organs; a function which was essential to the well-being, or even to the life of the animal. Yet, strange to say, though these organs were once intimately united, and are now widely separated, a mysterious subtle connection continues to exist between the thyroid gland and the generative organs, even up to the highest vertebrates. That the thyroid gland, situated as it is in the neck, should have any sympathy with sexual functions is likely enough if it originated from a glandular organ in connection with the sexual organs of the palæostracan ancestor of the vertebrate."

## CONCLUSIONS

1. The relation between the female genitals and the thyroid is very intimate.
2. The generative organs which stand in such close relation with the thyroid are the ovaries.
3. That the uterus is devoid of any influence upon thyroid activity except in that its function may affect the ovarian function and through this the thyroid.
4. Thyroid activity is in a measure under the governance of ovarian activity.
5. Ovarian hyperactivity is a frequent cause of the development of exophthalmic goiter.
6. Diminished or absent ovarian activity usually coincides with myxœdema.
7. Puberty, menstruation, pregnancy, lactation, and menopause, exercise a profound influence upon thyroid secretion.
8. Thyroid secretion and ovarian secretion do not supplement each other, they neutralize each other.

9. The ovary has two secreting structures, the corpora lutea and the interstitial cells.

10. It is the secretions from the latter which seem to bring the ovary and thyroid into such close relation.

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# COMPLETE SUBAPONEUROTIC PATELLAR FRACTURE

BY KELLOGG SPEED, M. D., CHICAGO, ILLINOIS

JONES of Liverpool has recently given us a masterly review of internal derangements of the knee joint, with its anatomy, describing clearly the prepatellar aponeurosis, lateral ligaments, and the position of the patella. A short time previous to this Andrews called attention to a method of dealing with patellar fracture simply by sewing the capsular ligament with catgut and allowing sufficient rest in bed, leg unsplinted and subjected to early passive motion. Feeling that traumatisms of the knee have such different results and manifest themselves in such unexpected directions I wish to report the following case.

Mrs. W. B., 30 years old, housewife, weight about 200 lbs. She complained of pain in the right knee, aggravated on motion. Examination at entrance showed the knee to be swollen rather symmetrically, especially the prepatellar area, which was very tender. There was also pain and tenderness on the outer anterior portion of the joint on pressure.

Three days later, when I saw her for the first time, she returned walking painfully, right leg almost useless. The following previous history was obtained: When 10 year-old she fell on her right knee and was confined to bed for three weeks, knee was ten. der and swollen but recovery was completes Seven years ago it again became tender and swollen at the anterior lower border of the patella. Since then at times when walking, she has had sharp pain in the outer side of the knee followed by swelling in the joint and a condition simulating locking, which she describes as a feeling that the joint turned backward.

The present condition consists of persisting pain and tenderness in the lower border of right patella, where there is swelling and a fading ecchymotic area two inches in diameter. Trauma to the knee more recent than five weeks is denied, about which time past she fell on stairs striking this knee, but did not consider the injury entirely disabling as she has run her sewing machine frequently since, until stopped by pain and swelling. Very close inquiry reveals that she has bumped her knee several times since the trauma mentioned.

No crepitus or false motion can be elicited in the patella and the skiagram shows no

Fig. 1. Case of Mrs. W. B. Complete subaponeurotic patellar fracture without separation.

loosened cartilage or lacerated ligaments shadow, either view. It does show line of fracture straight across patella at junction of lower and third quarters. (See figure.) She still has the giving way, locking sensation at times. A posterior plaster splint, leg in extension, and rest in bed were advised.

This treatment was applied accompanied by an ice bag. Pain quickly subsided and in three weeks she was up on a crutch with strength and function gradually returning in leg. Nine weeks later she walked up and down stairs freely with full use of leg. No return of locking sensation.

When the knee cap is fractured the prepatellar tissue rupture usually lies immediately over or slightly above or below the line of bone fracture, hence the frequency of intervening shreds of the aponeurosis which cause delay in healing or give a loose fibrous union. Accompanying injury of the lateral parts of the fibrous capsule may act in the same manner, or the swelling following the trauma and hemarthrosis resulting from the capsular tear may hold the fragments apart so that they can be easily palpated even when the separation has not been exaggerated and continued by the contraction of the quadriceps extensor muscle.

Complete subaponeurotic type of fracture is rare however, and as a rule skiagrams of subaponeurotic cases show a partial fracture of the patella, i. e., involving only part of its thickness or splitting but one side. This case showing complete transverse fracture is unique. It is more than probable that the line of tear in the prepatellar aponeurosis, if one occurred, was above the point of fracture in the bone, so far above it that its power of conservation of the joint structures in normal position was preserved and we find no evidence either clinically nor with the X-ray, of separation. The tissues round about were hematogenous but no capsular tear occurred that could be demonstrated as no great amount of hemarthrosis developed and the patella lay without floating over the joint.

Such fractures must be caused by direct violence, the aponeurosis, if torn, is not completely ruptured across, or gives way at a different level than the bony fracture and the resulting symptoms are the same as ordinary patellar fracture: localized tenderness, swollen knee, but no crepitus, no abnormal motility of patella or its fragments and no sulcus of separation. Loss of function varies, it may be as complete as in usual fracture. Swelling follows rapidly and one must often be confused not to find crepitus or other signs of bony break when all other symptoms point so strongly to it.

Traumatic bursitis occurring in a similar accident is located lower down, well below the line of the joint, onset of symptoms is usually slower and its tenderness is located either just above the insertion of the patellar tendon beneath and next the tibia when the subpatellar bursa is involved, or in front when the prepatellar bursa is concerned. The rather circumscribed and localized swelling of the prepatellar bursa is easily recognized.

These conditions should be differentiated as soon as possible for, while rest is indicated in all of them, more care should be taken to avoid early active use of the leg in the complete subaponeurotic patellar fracture, that refracture, later separation of fragments, prolongation of convalescence, trouble in the joint and weakening of the extensor power of the leg may not follow.

Such fracture does not demand open operation. Rest in an extended position even unbandaged might give good final result. A snug fitting adhesive dressing and ice bag applied early cause the periarticular swelling to disappear sooner and an earlier absorption of the hemarthrosis. If the pain is severe, and the patient is very stout as in this case, I believe it is wise to use a posterior plaster splint for the first few days, followed by a snug bandage, passive motion daily and an early safe use of the limb with crutches to avoid a long disability. Unsupported active use of the limb will not be possible before five to six weeks and then should be cautious. Full use may never return but in four to five months there should be little difference from the sound limb.

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# PRIMARY ABDOMINAL PREGNANCY IN A RABBIT[1]

By W. BLAIR BELL, B. S., M. D., Liverpool, England
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CONSIDERABLE interest and speculation still surrounds the etiology of ectopic pregnancy in the human female. Formerly tubal pregnancy was considered to be the only authenticated form of primary ectopic gestation. More recently, however, the occurrence of primary ovarian pregnancy has been well established by a number of observers; and in the last few years three probably genuine cases of primary peritoneal implantation (primary abdominal pregnancy) in the human subject have been reported by Galabin (1), Hirst and Knipe (2), and Witthauer (4).

The supposed rarity of ectopic gestation in the lower animals has often been commented upon as indicative of the pathological, rather than accidental, origin of these deviations from the normal state of affairs in woman. But while *primary* ectopic pregnancies are almost unknown in animals, secondary abdominal pregnancy is quite common, especially in rodents of the *lepus genus* (hares and rabbits). Such occurrences are due to the rupture of the uterine cornua, with the gradual extrusion of the fœtuses, the placentæ in some instances remaining attached to the original sites, while in other cases the ova have formed fresh attachments to the peritoneum (usually in the neighborhood of the stomach, owing to the tendency of the ovum to seek the lowest level). In fact, as far as I can discover, the only genuine cases of ectopic gestation in animals hitherto reported have been of the nature of secondary abdominal implantations subsequent to rupture of the uterine cornua. Many isolated instances of this condition have been recorded, and Kamann (3) in a very complete account of a case occurring in a rabbit gives a full bibliography of the subject. In his own case a single fœtus was found in the abdominal cavity. It was proved to be a case of secondary implantation, for sections through the uterus showed a well marked point of rupture.

According to Kamann in none of the other cases recorded in animals (about forty in number) was there sufficient evidence of primary ectopic implantation having occurred. He rightly holds that no case can be considered proved unless serial sections of the genital tract (and I would add of the ovaries) have been made, to exclude the possibility of a healed laceration, such as was found in his case. He concludes by stating his belief that there is no such thing as primary abdominal pregnancy.

I hope to prove that my case was undoubtedly of that nature. If such a thing can occur under physiological conditions in animals it surely can occur in women. There can be no doubt that the majority of cases of tubal pregnancy in woman are physiological rather than pathological, except in the results, being dependent upon the time and position of the ovum when fertilization takes place, and on

[1] Read before the Royal Society of Medicine, London, March 2, 1911.

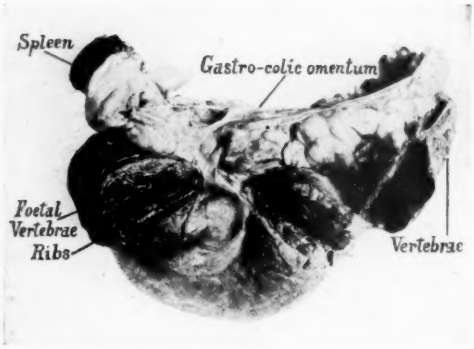


Fig. 1. Specimen removed.

the activity of the trophoblast. We must remember, too, that in the evolution of the human uterus we have acquired an organ that is probably less accessible to the ovum than is the bicornute uterus of the lower animals.

During the progress of some experiments on the physiology of the female genital organs which I was carrying out in June, 1909, I had occasion to perform the following experiments upon an adult multiparous doe which had been in the laboratory ten days, and during that time had not been near a buck.

1. The abdomen was opened by a small median incision between the last (inguinal) mammæ. The uterus was examined and found to be active, non-pregnant, and normal. The ovaries were removed. These did not contain any recent corpora lutea evident to the naked eye, such as is always the case in early pregnancy. The abdomen was then closed.

2. A month later the abdomen was again opened through the old healed scar. There were no adhesions. The uterus was partially atrophied. One horn was ligated, and the abdomen closed.

A month later the rabbit was killed and postmortem examination made. The uterus (the ligated horn being slightly distended) was removed entire, and also the ductless glands. When the abdomen was opened up a large tumor was found in the upper part. On examination *in situ* this was found to be attached and depending from the gastrocolic omentum by a broad narrow pedicle. The tumour was free elsewhere.

On macroscopical examination immediately after removal the tumour gave one the impression of being an old encysted blood clot. At the time, however, I examined it no further myself, but handed it over to Dr. H. E. Annett, Professor of Comparative Pathology in the University of Liverpool. He made three incisions into it, and on discovering fœtal bones kindly returned the specimen to me for further investigation.

When the specimen had shrunk somewhat bones could be seen projecting on the surface (Fig. 1). Dr. Thurstan Holland kindly took a skiagram of the specimen, which was found to contain the complete skeletons of four full term fœtal rabbits (Fig. 2). The age was estimated by comparison with a skiagram showing the skeletons of young rabbits immediately after birth (Fig. 3).

Histological sections made from various portions of the soft parts of the tumour only showed old blood clot: no placental structure could be seen. The presence, however, of the undisturbed skeletons was quite sufficient evidence of the nature of the specimen.[1]

It was now necessary to ascertain whether this were a case of primary abdominal implantation or one of secondary abdominal pregnancy. The former, as already stated, has never been definitely proved to occur in animals, while the latter is fairly common.

To arrive at a conclusion the ovaries, the Fallopian tubes and the uterine cornua were cut in serial sections. This proceeding occupied a long time, and to lessen the labor of examination only every fifth section was mounted: even then many thousand sections had to be examined.

In the ovaries seven fairly recent corpora lutea of the same date were found, two in one ovary and five in the other, and some degenerating follicles (Fig. 4). I believe from my experience of rabbits' ovaries that the former are some months old, and represent the corpora lutea corresponding to the fœtuses found in the abdomen. I may mention that in the ovaries of pregnant rabbits one can usually count the same number of recent pink colored corpora

[1] In the Museum of the Royal College of Surgeons, England.

Fig. 2. Skiagram of specimen.

Fig. 3. Skiagram of young rabbits immediately after birth.

lutea as there are fœtuses in the uterine cornua. The degenerating follicles represent a subsequent œstrum without connexion with the buck, for in the rabbit Graafian follicles only rupture during copulation, otherwise they degenerate.[1] I have been unable to detect any evidence of recent pregnancy or of rupture of the wall in any part of the uterine horns or Fallopian tubes. It has already been mentioned that there was not the slightest macroscopical evidence in the way of a scar or an adhesion. One would not, of course, expect to find evidence so long after of a coincidental intrauterine gestation had such a condition existed, but I am sure one would have found evidence of rupture of the cornua had there been any.

In all probability the specimen was several months old, and it is obvious, of course, that the operation could in no way have been responsible for the condition. In case any may be sceptical on general grounds, it may be pointed out that at the time of the operation the uterus was certainly not pregnant, even in the early stages. After a very extensive experience in operations on rabbits in all stages of pregnancy, I feel I could not have been mistaken. Apart from my own observations there are the facts that the rabbit had been in a cage alone for some time before operation, and that there were no *recent* corpora lutea in the ovaries—a conclusive point. But even supposing none of these observations had been made, it is still to be remembered that the *ovaries alone* were removed at the first operation, and that this procedure in rabbits leads to death of the ovum and abortion in the early stages of pregnancy. So that even supposing the operation had led to abortion into the peritoneal cavity implantation and development of the ova would not have taken place owing to the previous removal of the ovaries.

However, there is no doubt that the rabbit was not pregnant in the uterus at the time of the first operation, nor were there any signs

[1] This is the view generally held. But the exact significance and differentiation of the various changes in the Graafian follicles in rodents is not really fully understood.

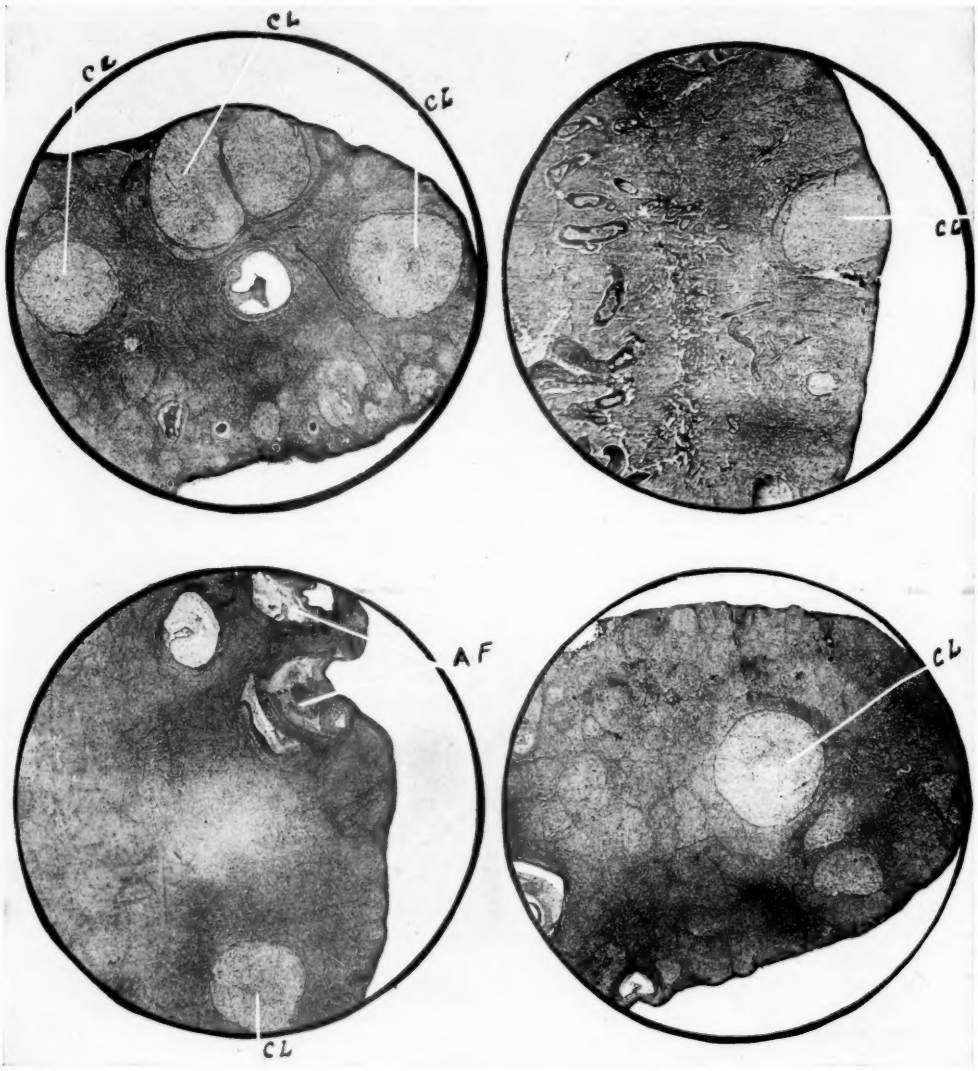


Fig. 4. Corpora lutea found in the ovaries.

that the uterus had been recently pregnant, nor that it had ruptured.

It may also be asked how it was that the tumour was not felt in the abdomen at the time of the first operation. I may say it was not discovered *as a tumour* until the whole abdomen was laid open; for to anyone accustomed to dealing with rabbits it is quite a common experience to feel in the abdomen large masses of food in the stomach or fæcal collections in the colon. Whether I felt the tumour or not during the operations I cannot say. If I did, being, as it was, unexposed and away in the upper abdomen it would have

made no further impression on my mind than that it was a collection of food or fæces.

I have been quite explicit about all that happened to the rabbit in order to meet any objections that could possibly arise in the minds of those who might otherwise have been sceptical.

There is nothing further to add except that it is remarkable how the *four* fœtuses should be so mixed up together; for in my own experience of a very large number of microscopical sections I have found that the Graafian follicles in rabbits' ovaries—unlike those of bitches—almost invariably contain only one ovum. At the same time many follicles rupture simultaneously during copulation (and it is believed only during copulation) with the buck. One cannot assert that no ova found their way into the uterine horns, as the course of the pregnancy was not observed; and intrauterine pregnancy may have been coincidental with the abdominal pregnancy. Indeed the number of corpora lutea seem to point to this conclusion. But it certainly adds considerably to the interest of the case that four fertilized ova should have been implanted together.

It is, of course, quite obvious that the site of implantation is a natural one in the circumstances, for the ova would travel along the curve of the ventral aspect of the abdomen.

The conclusion one must inevitably arrive at from a very careful study of this case is that primary abdominal implantation can occur in the lower animals, and that it cannot therefore be considered unlikely to happen in the human subject.

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# DEPARTMENT OF TECHNIQUE

## TRANSTHORACIC CARDIOTOMY—A NEW METHOD FOR THE CURE OF IMPASSABLE BENIGN STRICTURE OF THE ESOPHAGUS

By HERMANN FISCHER, M. D., New York City, New York
Adjunct Attending Surgeon

From the Surgical Division of the German Hospital in New York, Dr. O. Kiliani, Attending Surgeon

IN the following I wish to describe an operative procedure for the relief of impassable benign stricture of the esophagus in such cases where with all other methods one fails to enter the strictured portion of the esophagus, either from above or below. Every surgeon who has come across these cases knows the difficulties with which he is confronted. If we are unsuccessful in our attempt to pass an instrument through the stricture, the patient is condemned to feed himself by means of a permanent gastrostomy; a pitiable fate at best.

In June, 1910, a boy three years old, who had accidentally swallowed some lye a few weeks previously, was admitted to the surgical division of the German Hospital. In course of time a tight stricture developed which made it impossible for the child to swallow. At the time of his admission the boy could only swallow a few cc. of fluid. In case he attempted to swallow larger quantities instant regurgitation occurred. Solids or semisolids could not be swallowed for some time.

All attempts to pass a sound were futile, therefore a gastrostomy was performed. On opening the abdomen it was found that an hour-glass stomach had also developed in consequence of the action of the lye. A gastroplastic after the fashion of a pyloroplastic according to Heinicke-Miculicz was made, followed by a gastrostomy after Kader with Senn's modification. The rubber tube was pushed through the pylorus into the duodenum to put the sutured stomach at rest.

The X-ray picture which was made a few days after the operation, showed clearly a stricture of the esophagus, beginning at about the bifurcation of the trachea and ending 1½ cm. above the diaphragm. A thin threadlike shadow showed distinctly that some bismuth emulsion must have passed the stricture. All renewed efforts, however, to pass even the thinnest bougie were unsuccessful. It was then tried to flush a thread through with a catheter inserted into the pharynx through one nostril after the method advocated by Dunham, but all these attempts also failed. A last attempt was made under narcosis to pass a bougie from below through the gastrostomy, which, however, was also in vain. The patient was therefore fed exclusively through the gastrostomy. The boy unfortunately stood this feeding very badly. He was losing ground steadily and rapidly. He suffered from gastrointestinal disturbances with high temperatures which recurred although the utmost care was exercised to regulate his diet. I, therefore, carried out the following procedure:

Under Meltzer-Auer continuous insufflation of the lung the thorax was opened in the seventh intercostal space. The ribs were spread apart by the ribspreader. By pushing the well extended lung away from the diaphragm, it was noted that the incision was a little too high. A second incision was therefore made through the eighth intercostal space giving ample access to the lower part of the esophagus and the diaphragm. The lung was pushed upward and held out of the way by Japanese silk handkerchiefs sterilized in vaseline. The pleura, covering the esophagus was now split, both vagi nerves were carefully isolated from the esophagus and the latter was bluntly dissected out of its bed by means of forceps, which was easily accomplished and without bleeding. A loop of loosely folded gauze was put around the esophagus. By carefully pulling the esophagus upward by this loop of gauze it was loosened all around its attachment to the diaphragm, a pair of anatomical forceps was pushed through the layer of diaphragmatic pleura and peritoneum, and thus the peritoneal cavity opened. The stomach was now carefully pulled into the thoracic cavity

until a point was reached about 7 cm. below the point of entrance of the esophagus. The pleural cavity was now carefully packed off with the silk handkerchiefs, mentioned before, and a transverse incision made between two silk sutures as guides into the cardia, three cm. below the entrance of the esophagus. Through this incision a ureter catheter armed with a stylet and closed at the end was inserted. The stricture was then easily entered from behind and the catheter led out through the mouth, where it was secured by a clamp. A long curved dressing forceps was now inserted into the gastrostomy opening, the lower end of the catheter was caught and pulled through the gastrostomy. The two ends of the catheter were now tied together by a silk suture to guard against its being pulled out inadvertently. The incision in the cardia was now closed by double row of silk Lembert sutures, and the stomach replaced into the abdomen. The esophagus was fastened to the diaphragmatic ring by interrupted silk sutures, care being taken to grasp enough peritoneum to produce a broad apposition of peritoneum to the esophageal wall. The incision in the intercostal spaces was closed by interrupted silk sutures, which were slung around the rib above and below the incision, care being taken to have the lungs fully expanded. The intercostal muscles were sewed together by tight running suture of chromic gut. Skin suture with silkworm gut. Voluminous gauze cotton dressing.

The operation was not a difficult one and was accomplished in 45 minutes. Respiration and pulse were very satisfactory throughout. As the patient, who for the last part of the operation had only gotten air, commenced to react, it was necessary to give more ether. Unfortunately, the wrong clamp was removed from the ether carrying tube. A sudden rise of pressure occurred in the ether bottle through which a small quantity of ether was forced in the air carrying tube and into the lung. A sudden deep collapse took place, from which the patient was speedily roused by giving plenty of pure air through the pump. The small quantities of ether, however, were sufficient to set up a severe congestion of the lung to which the little patient succumbed 24 hours after the operation.

Although the operation terminated fatally through an unforeseen accident, I deem it of sufficient importance to recommend it for trial in such desperate cases.

The operation is technically simple and makes it possible for us now to attack successfully cases of stricture of the esophagus which we formerly had to leave to the questionable fate of lifelong feeding by means of a gastric fistula.[1]

[1] My experiences with this method on the human being and the animal will be published shortly.

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# TECHNIQUE OF MAGNESIUM RING BLOOD-VESSEL ANASTOMOSIS[1]

By VICTOR D. LESPINASSE, M. D. and JOSEPH EISENSTAEDT, M. D., D. D. S., Chicago, Illinois

### DESCRIPTION OF MAGNESIUM RINGS

THE author's magnesium rings are made of chemically pure magnesium in various sizes, gauged according to the size of the large central hole. They are flat, washerlike pieces of metal, with a thickness of one millimeter, and a wall of from one to two millimeters in width. On the wall, eight suture holes are located equidistantly which have been countersunk or beveled to prevent cutting of the sutures when traction is made in tying them. Likewise the circumferential and luminal edges are beveled to prevent injury to the coats of the vessel. The rings are made in sizes from 1 to 35 mm. In the rings having a lumen over 10 mm. there are more than eight holes but the technique of using them is the same.

### MAGNESIUM PLATES

These are strips of magnesium 2 mm. wide and ½ mm. thick. They have small suture holes placed 3 mm. apart and are of indeterminate length. These plates are used to repair longitudinal cuts or slits in blood-vessels.

### ABSORPTION OF MAGNESIUM IN THE BODY

The chief salts giving the blood its alkalinity are $NaHCO_3$ and NaCl. The chloride of Na particularly, is very active in the dissolution of magnesium, producing MgCl. But in the body, MgOH is formed first and then the magnesium chloride for magnesium is less attacked by the halogen elements and salts, than by the action of the hydroxides of Na, Ca, and K. The temperature of the body is far below the degree of

[1] Read before The Kansas City Academy of Medicine, Kansas City, Missouri, February 18, 1911.

heat necessary to produce any very rapid dissolution of the magnesium. The absorption of the magnesium in the body is quite slow. The amount of hydrogen gas produced in a day is approximately 2 cc., and this amount can be easily cared for by the tissues without any toxic effects resulting. We have learned by post-mortem examinations from the dogs that succumbed, that the presence of pus around the site of the anastomosis in the artery prevents the absorption of the metal. The complete absorption of the magnesium rings varies according to the quantity to be dissolved. A 3.5 mm. ring, the size used frequently on a dog's carotid artery, produces about 60 cc. of halogen gas. This is calculated on the basis that one milligram of magnesium produces 1 cc. of hydrogen gas. The average ring is completely absorbed in from 60 to 100 days. No tissue irritations have been noticed around the ring, hence the salts produced are not irritative.

TECHNIQUE

*Method 1*

In this method one uses a lock stitch and one ring. A piece of white thread is discolored by silver nitrate solution in such a way as to make four alternate segments of white and four of black. These segments should be about 8 to 10 inches in length.

In Figure 1 the thread is marked in such a way as to have, first, a black segment and then a white segment; at the junction of each segment a needle is placed. After seven needles have been placed on the thread in their proper positions, the eighth needle is passed over the two ends of the thread, thus making a circular suture, Figure 2. Now pass these eight needles through the holes of the ring as shown in Figure 3. The threaded ring is next slipped over the proximal end of the cut vessel, and the needles passed through all of the coats of the vessel wall, which is steadied by being grasped in fine tenaculæ, Figure 4.

Figure 5 shows the ring on the proximal end of the vessel, the sutures passed through the vessel wall at eight equidistant points and then passed through the wall of the distal end of the vessel.

Figure 6 shows the needles removed and the black segments of thread placed beside their corresponding black segments and the white segments beside the white segments all ready to be tied down.

Figure 7 shows the sutures tied and the vessel ends completely united.

In this method the ring acts as a guide for placing the sutures and also as a splint for preventing constriction, as the entire circumference of the vessel is in the grasp of the suture.

*Method 2*

Employs two rings, within which the vessel ends are sewed by four sutures and then the two rings are united by four interrupted sutures. After an appropriate sized ring is slipped over the distal end of the vessel a suture is passed, first through the vessel wall from intima through adventitia and then through a hole in the ring. The suture is tied and the tissue forceps removed to permit the vessel to assume its proper relationship within the ring, as shown in Figure 1.

A point on the vessel wall is then determined which is directly opposite to this first suture. At this point a second similar suture is passed through all the coats of the vessel and then through the appropriate hole in the ring. This suture is drawn up and tied and we have the picture shown in Figure 2. The location of the third suture is determined by bisecting the vessel wall between the two previously passed sutures. After this point is determined a suture is passed there through the vessel walls and then through the appropriate hole in the ring. When this suture is drawn up and tied we have the picture as shown in Figure 3.

The fourth suture is passed on the opposite side of the vessel exactly as the third was passed; after it has been placed and tied, you have the vessel lumen assuming a quadrangular outline, Figure 4.

These sutures should be of triple O silk, and the knots should be placed on the edges of the ring, so as not to interfere with the coaptation of the rings when they are finally brought together.

Figure 5 shows both the distal and proximal vessel ends sewed into the rings by the four sutures and the first coapting suture, passed;

Fig. 1 shows the zebrated thread with four white segments and four black segments and eight needles, one at each juncture of the white and black segments.

Fig. 2 shows the two ends of the thread passed through the last needle.

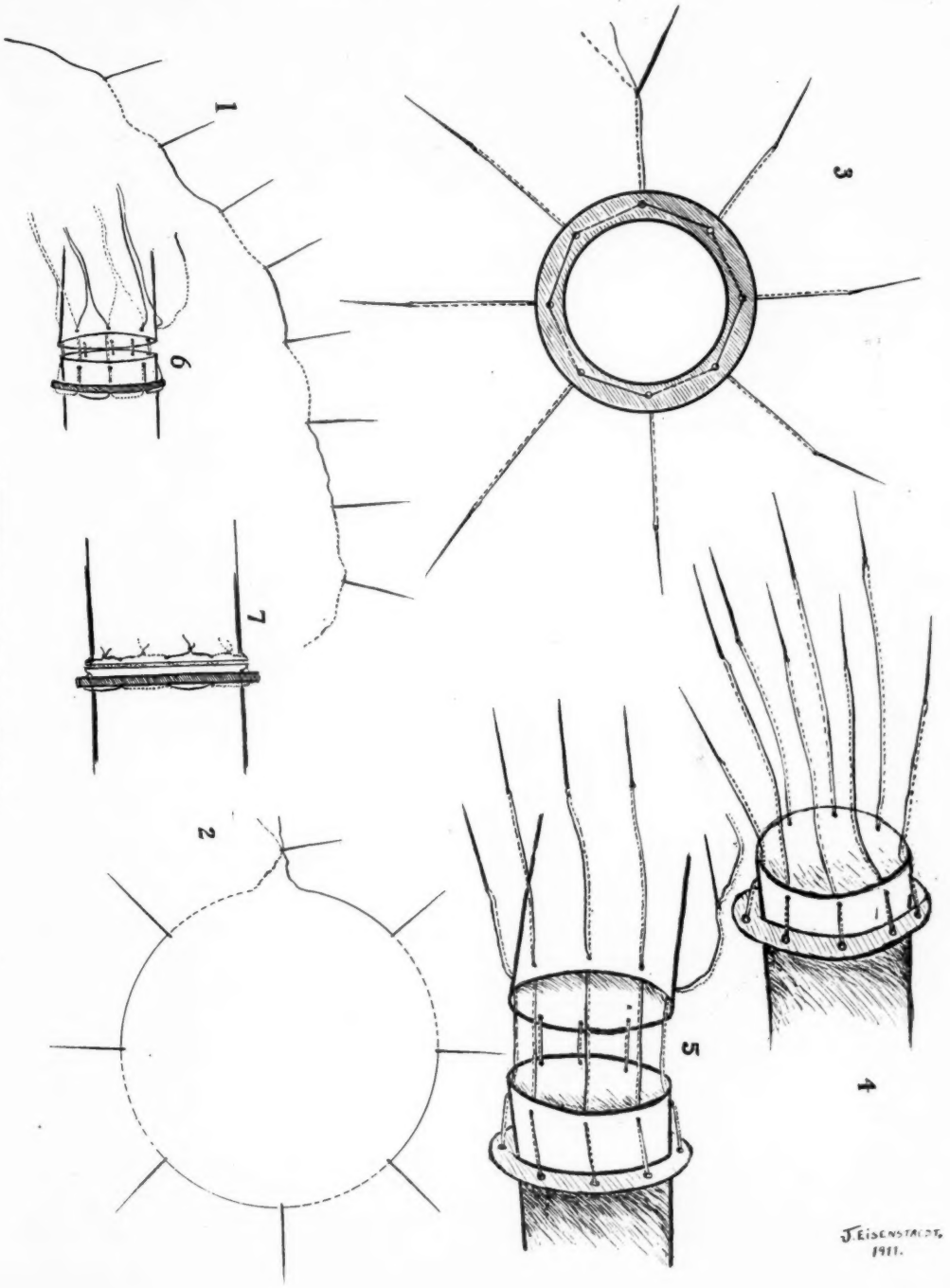
Fig. 3 shows the ring threaded with this thread.

Fig. 4 shows the threaded ring slipped over the vessel end and all of the needles passed through the vessel wall from outside in.

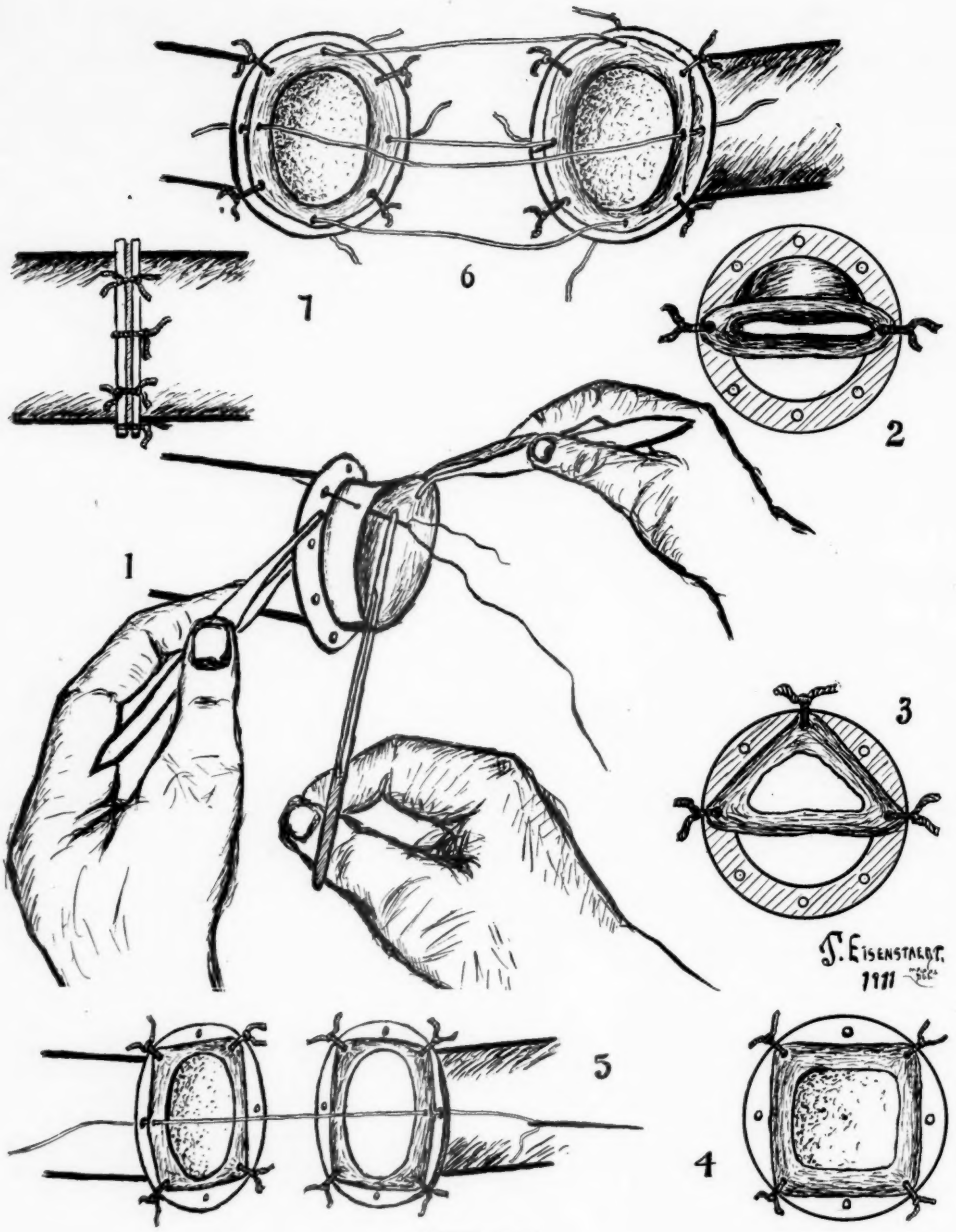
Fig. 5, the same as Fig. 4, and in addition shows the opposite vessel end with all of the needles passed through its wall from inside out.

Fig. 6 shows the needles cut off and the appropriate white segments approximated and the appropriate black segments approximated, ready to be drawn up and tied.

Fig. 7, the white sutures tied to white and the black to black, and the operation completed. Note that the entire vessel circumference is in the grasp of a lock stitch.




METHOD I — *See legends on opposite page.*




METHOD II

Fig. 1 shows the ring slipped over the vessel end and the first suture being passed through the vessel wall from inside out and then through a hole in the ring.

Fig. 2 shows the second suture passed and tied, this suture being diametrically opposite the first one.

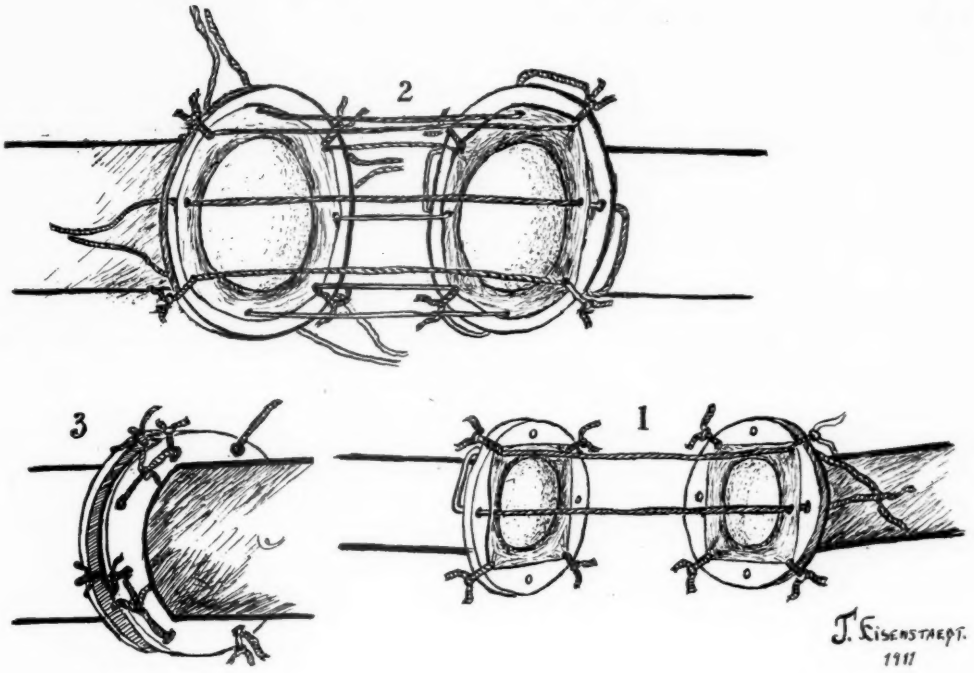
Fig. 3 shows the third suture passed and tied.

Fig. 4 shows the fourth suture passed and tied.

Fig. 5 shows the first approximating suture passed.

Fig. 6 shows all four of the approximating sutures passed.

Fig. 7 shows the approximating sutures tied and the operation completed.




METHOD III

Fig. 1 shows the first mattress suture passed. Note that the hole through which one of the sutures was passed sewing the vessel end into the ring is used for the mattress suture also.

Fig. 2 shows all four of the mattress sutures passed.

Fig. 3 shows the mattress sutures drawn up and tied and the operation completed.

first, through the hole in the ring then through the everted flap of the distal end of the vessel then through the everted flap of the proximal end of the vessel and finally through the adjacent hole of the second ring.

In Figure 6 we see all four of these interrupted sutures passed, each suture including within its grasp the two rings and the entire thickness of both everted vessel ends.

Figure 7 shows the vessel ends approximated by the drawing up and tying of these four interrupted sutures. This method only has four points of approximation in the circumference of the vessel and for the larger arteries this is not sufficient. The four approximating sutures only include in their grasp, a small amount of the metal of the ring and frequently this metal is cut through; a serious complication as the operation must be done all over again; for the smaller arteries and particularly veins this method is good but not so good as method 3.

*Method 3*

Is similar to method 2 up to and including Figure 4. In this method four mattress sutures are passed making eight points of approximation between the two rings instead of four as in method 2.

In Figure 1 you see the first mattress suture with its two needles, one at each end passed, first, through the hole of one ring and then through the everted flap of one vessel end, from outside in, then through the everted flap on the opposite side from inside out, and finally through the appropriate hole in the second ring. The second portion of the first mattress suture is now passed through the adjacent hole of the ring and the vessel ends in the same manner as the first. The suture passes through the holes previously used for the sutures sewing the vessel ends into the ring.

Figure 2 shows all four of the mattress sutures passed, the needles removed, and the sutures ready to be drawn up and tied.

Figure 3 shows the four mattress sutures tied, and the operation completed.

*Method 4*

Consists of using two rings, one of which is threaded with four mattress sutures, Figure 1, and four guy sutures used to space the four mattress sutures properly.

Figure 1 shows the ring threaded with four mattress sutures each suture being armed by a needle at each end.

Figure 2 shows the threaded ring slipped over the proximal vessel end.

Figure 3 is the same as Figure 2 and in addition it shows the second ring slipped over the distal vessel end.

Figure 4 shows the four guy sutures passed through the walls of both the distal and proximal vessel ends.

These guy sutures are so placed that they divide the circumference of the vessel into four equal parts.

Figure 5 shows that the next step is to make traction on two adjacent guy sutures; these will pull the vessel ends into contact with each other. Then one leg of a mattress suture is passed directly beneath one of the guy sutures (b) and the other leg midway between the two guys (a and b) one of the guys (a) is dropped and the guy suture (c) adjacent to the one held (b) is now picked up. Traction is now made on these two and the next mattress is passed. After all four of the mattress sutures are passed as in Figure 6 the guys are removed and the mattress sutures are drawn up and tied as shown in Figure 7.

*Method 5*

In this method two rings are used one of which is threaded as in method 4, Figure 1, and the other is sewed into one of the vessel ends as in method 2, Figures 1, 2, 3, and 4. First the threaded ring is slipped over one vessel end and suture No. 1 passed through the vessel wall from outside in, as in Figure 1. Next the suture diametrically opposite to No. 1 is taken up and passed through the vessel wall at a point exactly opposite to suture No. 1, Figure 2.

Traction is now made on both of these sutures. This force draws the vessel up into the ring and everts it slightly over the ring. Suture No. 3 is now picked up and passed exactly in the center between sutures 1 and 2, and you have the picture shown in Figure 3. The assistant now drops suture 2 and grasps suture No. 3. Traction is made on these two and suture No. 4 is grasped and passed exactly halfway between Nos. 1 and 3, and then you have the conditions as shown in Figure 4. Suture No. 1 is now dropped and suture No. 2 taken up, traction is made on 2 and 3 and suture 5 is passed midway between 2 and 3 and then we have Figure 5. Sutures 6, 7, and 8 are now passed in a similar manner and when they are all passed the picture is as shown in Figure 6 with the vessel everted out over the entire circumference of the ring. Next a ring is sewed into the opposite vessel end, using the same technique as in method 2, Figures 1, 2, 3, 4. The next step is to pass suture No. 1 through the everted vessel end from within out and the appropriate hole in the second ring; then suture 4 is passed in the same manner, and we have the picture shown in Figure 7. Then the remainder of the sutures are passed in their appropriate places, care being taken that they do not become crossed or the vessel twisted. Figure 8 shows all the mattress sutures passed and now the vessel is ready to be washed out and then the sutures drawn up and tied as is shown in Figure 9.

TECHNIQUE FOR USE OF MAGNESIUM PLATES

After the clamps have been placed and tightened and the part of the vessel is washed which is between the clamps, two guy sutures are passed one at each end of the slit. Then the length of the slit is determined using a millimeter gauge. Two plates, Figure 1, are then cut slightly longer than the length of the slit, but always having an even number of suture holes. One of the plates is now threaded with mattress sutures having a needle on each end, Figure 2. A guy is passed through the vessel walls at each end of the slit. The non-threaded plate is placed on one side of the slit and the threaded plate on the opposite side; your assistant keeps the thread from tangling and hands the sutures to you at the proper time. Commence at one end of the slit passing the first suture through the vessel walls beyond the end

Fig. 1 shows ring threaded with four mattress sutures with a needle on each end.

Fig. 2, threaded ring slipped over one of the vessel ends.

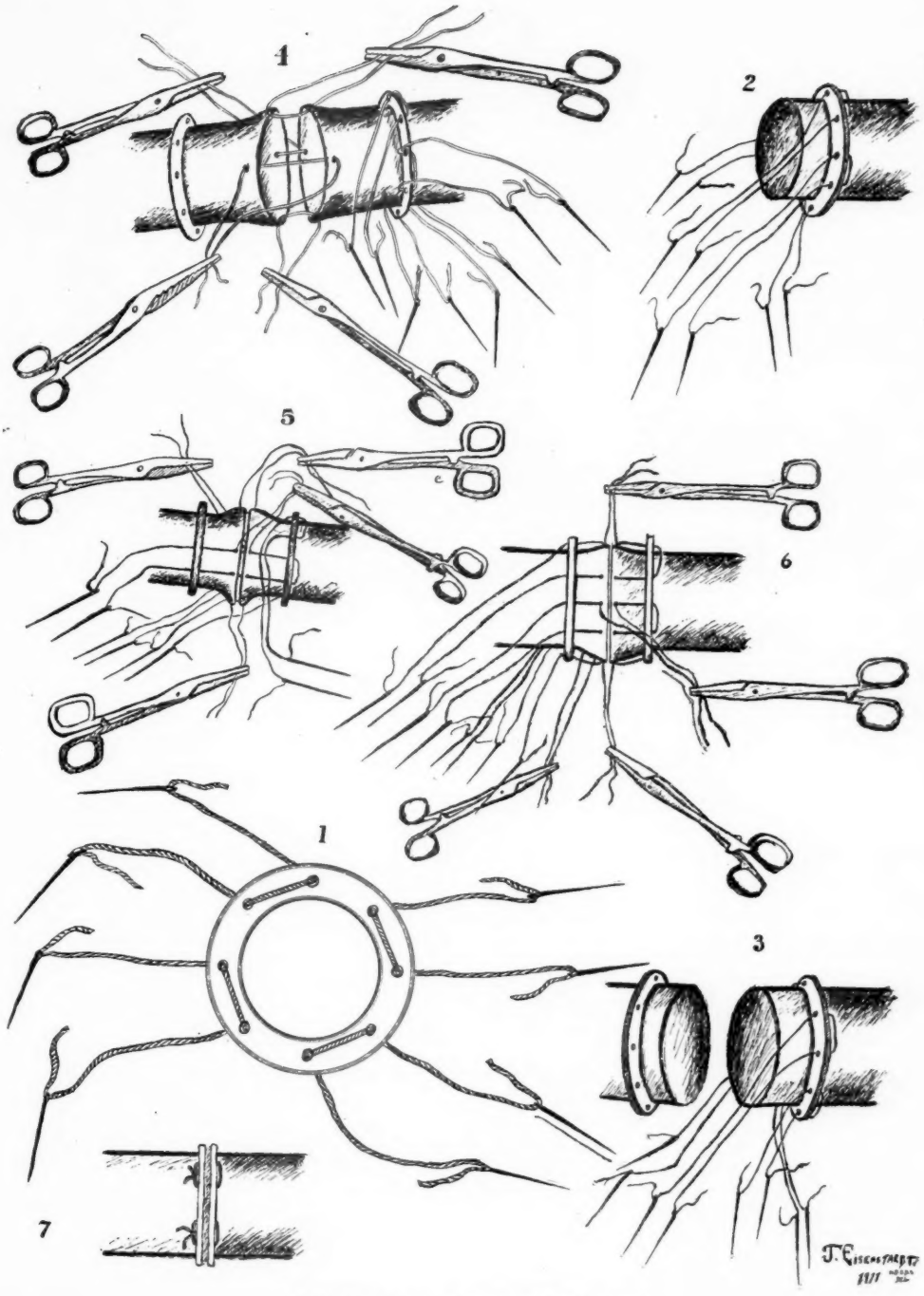
Fig. 3 same as Fig. 2 and a ring slipped over the other vessel end.

Fig. 4 shows the two vessel ends approximated by four equidistantly placed guy ropes.

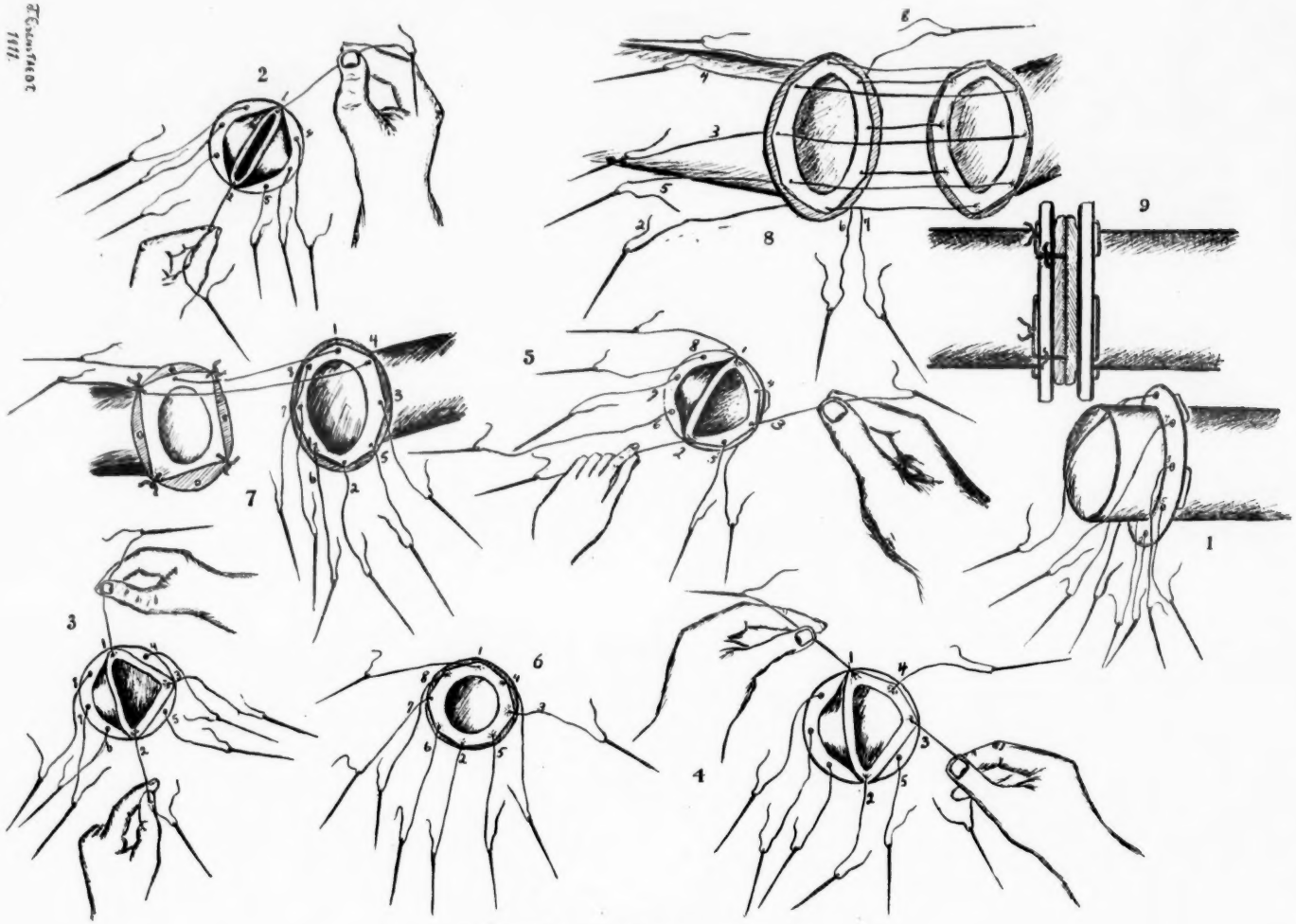
Fig. 5 shows the first mattress suture passed; one leg of the mattress immediately beneath the guy rope, the other leg half way between the two guy ropes.

Fig. 6 shows all of the mattress sutures passed.

Fig. 7 shows the guy ropes removed and the mattress sutures tied completing the operation.




METHOD IV — *See legends on opposite page.*



METHOD V — *See legends on opposite page.*

of the slit and continue passing each suture in its proper sequence till the last one is passed like the first beyond the end of the slit. Now they are ready to be drawn up and tied as shown in Figure 3. Figure 4 shows the guy ropes removed and the sutures drawn up, and tied, thus completing the repair. Figure 5 shows a cross section of the completed operation, showing how the plates and sutures are entirely extravascular and also shows that there is a very slight narrowing of the vessel lumen.

### MINOR TECHNICAL POINTS

Dissection. The blood-vessel to be anastomosed must be dissected clean and the wound must be dry. The vessel should be exposed from one to two inches; if you do not expose enough it makes placing of your sutures difficult, while if you expose too much it increases the difficulty of removing the clots from the ends of the vessel.

Clamps. The clamps must be placed with just the right amount of compression, neither too tight nor too loose.

If the vessel is not dissected clean and cleared of almost all fascia, fat, etc., there is great danger of the vessel end slipping back through the clamp, a very annoying and serious error in technique.

Adventitia. The adventitia projects beyond the cut end of the vessel in a sort of cuff. Figure 1. Grasp it, pull it down and cut it off flush with the vessel end. Figure 2. It now retracts and is out of the way and the vessel end is clean. Figure 3. If this is not done thoroughly the adventitia is quite likely to be caught in the sutures and dragged through the vessel walls projecting into the lumen as a little mass, thus favoring clot formation.

Washing and drying. Wash out the vessel ends with a large syringe and salt solution. While operating prevent the vessel from becoming dry. Either have an assistant pour salt solution over them at intervals, or smear them thoroughly with vaseline or alboline.

Size ring. What size ring is to be used? Use a ring having a lumen of the same diameter as the blood-vessel to be joined. Measure the vessel before it is cut while the blood is flowing through it, or measure it behind the proximal clamp after it is cut, if it is an artery, or the distal clamp if it is a vein. A smaller ring than this can be used with consequent slight narrowing of the vessel lumen but a larger one can not be used as you will be unable to stretch your vessel up into it. The arteries, contrary to the general belief, are not surgically elastic. When they are functionating and the blood is flowing through them, they are distended almost to their maximum; they have an elasticity just sufficient to produce the eversion necessary for the union and still maintain their original lumen. When they are cut they contract markedly. The veins have practically no elasticity; hence for veins, a ring having a lumen of ½ mm. less in diameter than the original vein is used.

Sterilization of rings and plates. The rings and plates can be boiled an indefinite number of times in ordinary Lake Michigan water or in distilled water. If soda is put into the water the rings are eroded a trifle and possibly they would also be eroded if boiled in a strong limestone or alkali water.

Passing the mattress sutures. While passing the sutures great care should be observed that one does not traumatize the everted intima, either by false needle pricks or by the needle holder being pushed up against the intima.

Care should be taken that the vessel is not twisted or rotated in passing the sutures from one ring to another. Your assistant should see that the sutures do not become tangled or soiled with blood serum.

Tying sutures. In tying the final mattress sutures do not forget that in reality the vessel is being clamped; do not pull the sutures too tight. Approximation is all that is necessary. Avoid crushing — an important point. According to Balance and Edmunds a force of two to three pounds occludes and one from five to eight pounds ruptures the vessel coats; so use slightly more than three and less than five in tying your sutures.

Various sized vessels. If it is desired to join

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Fig. 1 shows threaded ring slipped over the vessel end and suture No. 1 passed through the vessel wall from outside in.

Fig. 2 shows suture No. 2, which is diametrically opposite No. 1, passed through the vessel wall from outside in, traction being made upon both sutures.

Fig. 3 shows suture No. 3 passed midway between sutures Nos. 1 and 2.

Fig. 4 shows traction on sutures Nos. 1 and 3, and suture No. 4 passed.

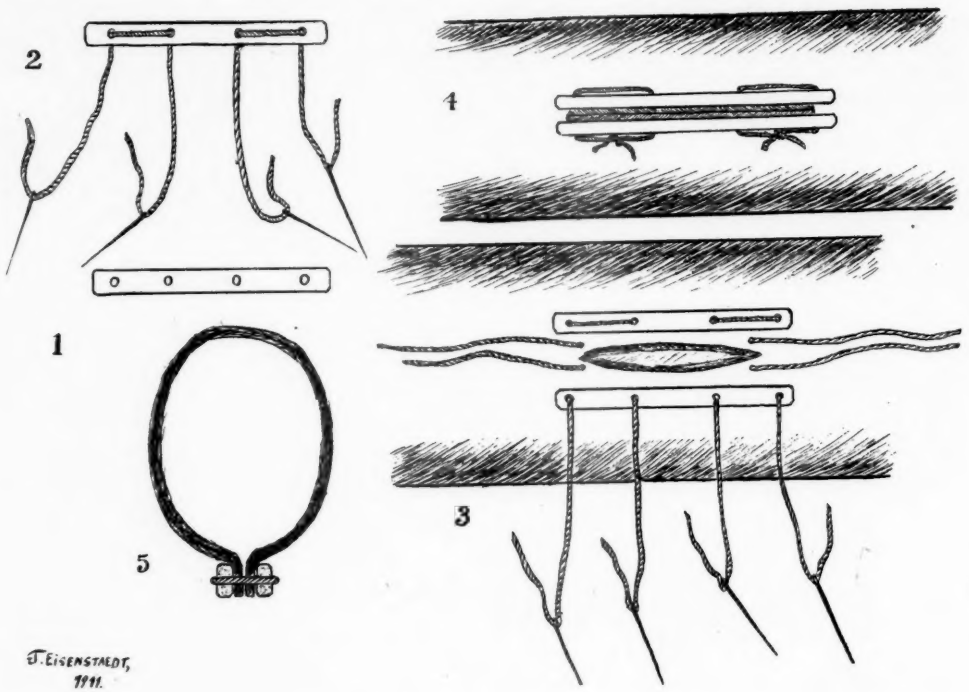
Fig. 5 shows traction on sutures Nos. 2 and 3 and suture No. 5 passed.

Fig. 6, all of the sutures passed through one vessel end.

Fig. 7 is same as Fig. 6 and in addition shows a ring sewed into the opposite vessel end with four sutures and one of the mattress sutures passed through it.

Fig. 8 shows all of the mattress sutures passed through the opposite vessel end.

Fig. 9 shows mattress sutures drawn up and tied and the operation completed.




LATERAL SLIT REPAIR

Fig. 1 shows simple plate.
Fig. 2, the plate threaded with two mattress sutures.
Fig. 3 shows slit in the vessel with a plate on either side and two guy ropes passed at each end of the slit and the sutures passed through the vessel walls and through both plates.
Fig. 4 shows guy ropes removed and the mattress sutures tied down and operation completed.
Fig. 5. Longitudinal section of the completed operation showing that all the sutures and rings are entirely extravascular and do not come in contact with the blood stream.

vessels of dissimilar sizes, use a ring of a size suitable to the smaller vessel.

### LATERAL ANASTOMOSIS

The original round rings can be used for lateral anastomosis, but it is best to have a ring of an elliptical shape as shown in Figure 1. The technique is the same as in end to end union with slight modifications that will suggest themselves to any surgeon.

Vaseline. The ends of the vessels are smeared with plain sterile vaseline and all the sutures are heavily coated with it.

### COMPLICATIONS AND SEQUELÆ

Stricture. There has been no stricture in any of our operations. If one is compelled to use a ring too small, through a lack of the proper size, or if a ring too small is used due to faulty measurement of the vessel, a narrowing of the vessel lumen is sure to occur.

Hæmorrhage. When using the suture method a certain amount of hæmorrhage occurs, when the clamps are removed. With magnesium rings there should be absolutely no hæmorrhage when the clamps are removed. Secondary hæmorrhage has occurred only in the presence of sepsis, and is common to all methods, but is less likely to occur when using magnesium rings, as the ring itself holds the vessel to a certain extent and relieves the strain on the suture.

Thrombosis. The prevention of thrombosis depends upon two factors: 1. Protection of the intima from trauma, while the sutures are being passed. 2. The tying of the mattress sutures under the proper amount of tension. Dr. Lespinasse has experimented with the various substances used by physiologists to prevent clotting

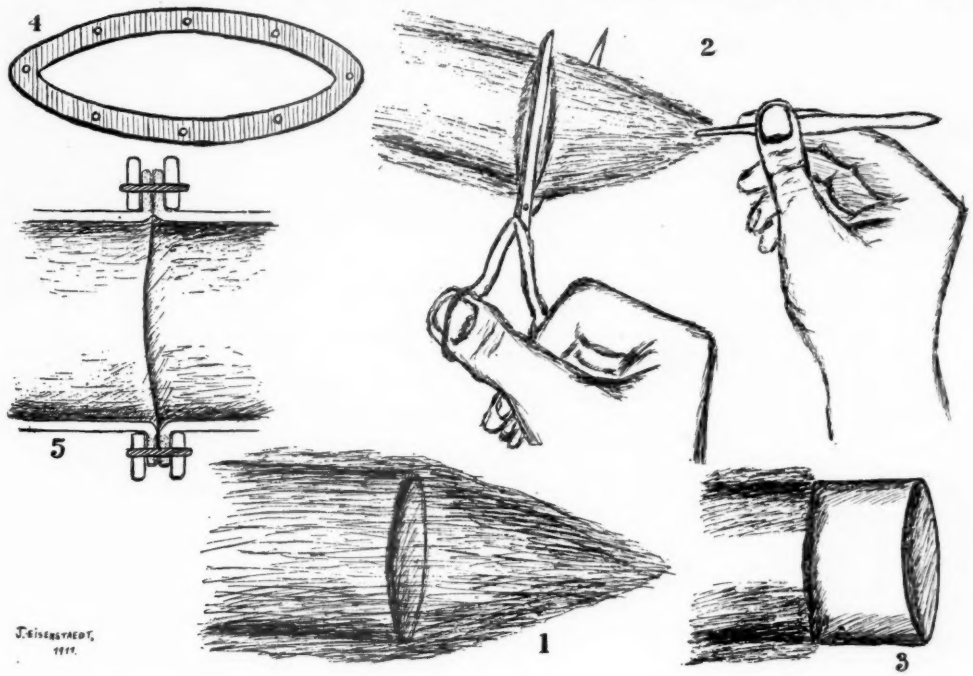



Fig. 1 shows vessel end with its cuff of adventitia.
Fig. 2 shows cuff of adventitia pulled down and the scissors cutting it off flush with the vessel end.
Fig. 3 shows the clean vessel end after the adventitia has been removed.
Fig. 4, elliptical ring to be used for lateral anastomosis.
Fig. 5. Longitudinal section of the completed end-to-end anastomosis showing that the sutures and rings are entirely extravascular and do not come in contact with the blood stream.

of the blood, such as peptone and magnesium sulphate. These were incorporated in lanoline and vaseline as a salve, and smeared on the vessel ends and on the sutures. They did not accomplish the desired result and have been discarded. Operative trauma is prevented by grasping the vessel with fine tenaculæ or rat tooth tissue forceps; instruments that make clean punctures and do not crush. Care must be taken that these punctures be in front of the line of union.

Aneurysms. In veins, aneurysms will practically never occur. First, the longitudinal pull is very slight, and second, the blood pressure is practically nil. In arteries, aneurysms will occur in a certain percentage of cases. There is a positive blood pressure in the arteries and a considerable longitudinal pull, but the most important factor is sepsis. If there is an aseptic healing, all of the coats will be completely united in seven to ten days, but if there is an infection healing is delayed. The intima, which has the enormous reproductive property common to all endothelial membranes, adheres and heals rapidly but the infection retards the reparative process in the muscle and adventitia till the sutures cut out and then the muscle retracts and the gap is filled by fibrous tissue which ultimately stretches, forming an aneurysm.

## CONCLUSIONS

This method is superior because: 1st. The suturing is not fine. It is quite coarse. 2d. The sutures and ring are extravascular and do not come in contact with the blood stream. The normal intima alone comes in contact with the blood stream at the completion of the operation. See longitudinal section of end to end anastomosis and cross section after lateral slit repair, Figure 5.

# A NEW TECHNIQUE FOR CIRCUMCISION

By WILLIAM HESSERT, M. D., Chicago, Illinois

ONE would suppose, considering the antiquity of the operation of circumcision, that all of the different possible varieties of technique had long since been worked out and developed. The performance of a circumcision is beset with one great difficulty, especially to the novice, consisting in the elasticity and sliding of one upon the other of the two folds of skin constituting the foreskin. A miscalculation of these features results in cutting off too much or too little, first of the skin, second of the so-called mucosa. The author has seen an operator pull down the foreskin, and after cutting off what seemed to be the redundant portion, find to his utter amazement that there resulted a denuded zone above the glans around the shaft of the penis and the real foreskin was still in situ. At other times too little skin is removed resulting in subsequent contracture of the scar and recurrence of the original phimosis. These and other unsightly results are not infrequently seen by every physician.

Believing that the mobility and sliding of the two folds of skin are the main factors to be regarded in performing an accurate operation, the author has devised the following technique, the distinctive feature of which is the immobilizing of the two folds of skin as the operation proceeds, resulting in unerring accuracy when the foreskin is severed.

After the usual preparatory cleansing and separation of adhesions when necessary, the foreskin is allowed to resume its normal shape and position. Then what seems to be the edge is grasped with two fine pointed forceps in the median line of the dorsal surface. Thereupon slight traction is made to put the skin on the stretch. With a straight scissors a dorsal incision is then made starting between the two forceps, taking care not to deviate from the median line, and ending close to the corona (a-b Fig. 1). A straight needle threaded with fine catgut is inserted at point b (Fig. 2). The skin and mucosa in the angle are picked up by the needle, being careful not to include too much tissue. The suture is then tied tightly and the ends left long and held with an artery forceps. (Fig. 2.)

While the parts are kept on the stretch, the ventral median incision is made with the scissors, beginning at point C (Fig. 2) and extending to and through the frenum. The latter should always be snipped transversely to remove this band of tissue, and obliterate the little pockets to either side. With a forceps the newly made corner of each flap is caught up at C (Fig. 2 and 3). One then proceeds with the insertion of an anchoring suture at the site of the frenum (d, Fig. 3). This is a sort of mattress suture made as usual with a straight needle and fine catgut. The needle is inserted slightly to one side of the median line as in Fig. 3, and after transfixing the skin and mucosa on one side, is carried across and back on the other side (Fig. 3). This suture when tied closes the triangular area of the frenum, and generally stops all bleeding. Sometimes another interrupted stitch must be taken through the frenum either to close the still existing wound or to stop oozing. The mattress suture after being tied is left long and clamped. At this stage then, we have two quadrilateral skin flaps (abdc Fig. 4) with a tractor at each angle preventing the two lamellæ of skin from sliding upon one another. By pulling on the catgut tractors at b and d (Fig. 4) and the forceps at a and c, the flap of skin can be held immovably. With scissors the flap can then be cut deliberately and accurately as close to the corona as is desired and with the utmost precision. After ablation of the two flaps the edges of skin are sutured with a straight needle and fine catgut. Few stitches are required, three to five on each side being usually sufficient. They are tied tightly, and very little tissue having been caught up, they will soon necrose through. All bleeding should previously have been accurately controlled by ligature or Blunk forceps. Accurate hemostasis is essential to good healing.

The dressing is applied with cotton and compound tincture of benzoin. A small bit of cotton is laid over the line of incision and then painted over with the tincture. The dressing, which should not be too bulky, will not adhere if there is still any oozing. After the dressing has become dry the penis can be wrapped in a piece of gauze or cotton. This makes an excellent dressing especially for children, as it protects the wound against infection by the urine. It is equally commendable for adults as it is smooth and not bulky. The dressing is allowed to remain in place until it loosens of its own accord. Rarely, owing to edema and constriction, it must be cut through sooner. Usually after one week the dressing will have loosened and upon removal many of the suture knots will be found adhering to it,

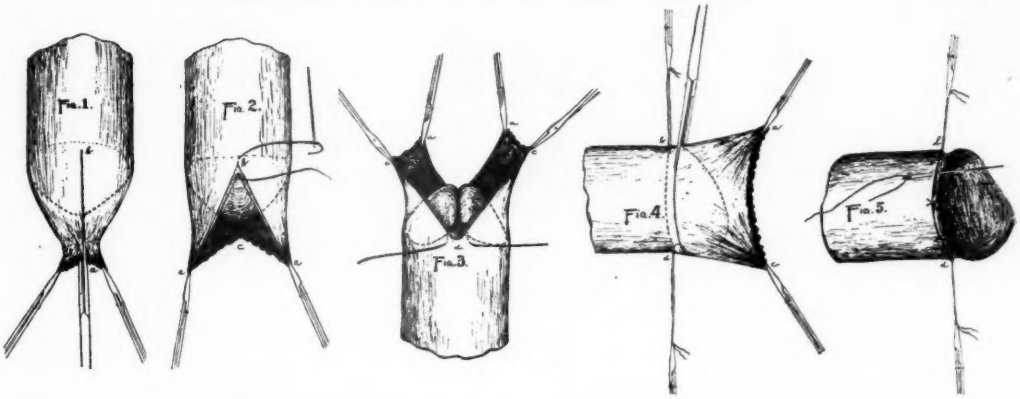



Fig. 1. Dorsal aspect of the penis; glans is outlined by dotted line. Forceps clamped and dorsal incision made from a to b. Forceps in illustration should be nearer median line.

Fig. 2. Dorsal incision has been made and first suture has been inserted at angle b. At point C ventral incision is begun.

Fig. 3. Ventral incision has been made to frenum d. The corner of each flap is being held by a forceps. A mattress suture has been inserted at the frenum. The ends of the suture are left long and clamped.

Fig. 4. The quadrilateral flap is being held taut and the scissors are shown in the act of cutting through the flap parallel to the corona.

Fig. 5. While the parts are being steadied by the tractors at b and d, the wound is being sutured with straight needle and fine catgut. Very little tissue is caught up, and after tying tightly the threads, including the tractors are cut short.

having in the interim necrosed through. After this the wound is dressed in the ordinary manner, a second application of the tincture not being necessary. The operation is recommended for its simplicity, accuracy and efficiency. I am indebted to Dr. Geo. J. Aste for the drawings.

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# FRACTURES OF THE MANDIBLE

By THOMAS L. GILMER, M. D., D. D. S., Chicago, Illinois

### LINE OF FRACTURE

FRACTURES may occur in any part of the mandible, but are more frequently found in the region between the first molar and the lateral incisor, and at or just in front of the angle. Figs. 1 and 2 illustrate two common forms of fractures of the jaw, they also illustrate the usual displacement accompanying such breaks as a result of muscular traction.

### DISPLACEMENT

In multiple fractures displacement is generally much more marked, especially is this true when there are two fractures occurring near the bicuspids, one on each side. In such cases the middle fragment is generally much depressed, while the other fragments are elevated, causing an ugly deformity.

Fractures posterior to the third molar in the region of the angle are not usually indicated either by facial deformity or by faulty occlusion of the lower with the upper teeth. Such fractures are frequently overlooked by the surgeon, when there are at the same time other injuries more palpable, they not being discovered until the patient's attention is directed to them through inability to properly masticate his food or by pain in the region of the break on attempts at mastication.

### DIAGNOSIS

Diagnosis of mandibular fractures anterior to the angle is not difficult, if the force causing the break is sufficiently great to completely sever the periosteum, as well as the bone. Under such conditions the alignment and occlusion of the teeth is more or less disturbed. This together with mobility and crepitus, both of which are always present, easily indicates the nature of the injury. More or less swelling of the external soft parts is usually present. Pain

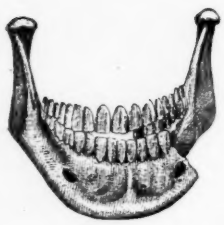

Fig. 1.

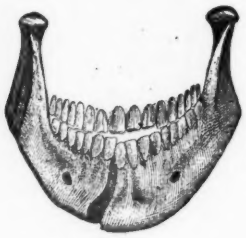

Fig. 2.

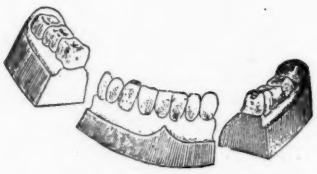

Fig. 3. Cast of lower jaw sawed in two.

except from movement of the ends of the fragments on each other is not serious.

A fracture near the angle when displacement does not indicate it may be demonstrated by applying the thumb of the right hand on the occlusal surfaces of the teeth while the fingers of the same hand support the base of jaw. The fingers of the left hand rest against the posterior margin of the ramus, and the thumb of the same hand supports the anterior margin. If the bone is fractured between the parts thus grasped, mobility is induced if force be applied to it.

Fractures of the neck of the condyle may present the same anatomical disarrangement of the body of the bone as is found in a unilateral dislocation, that is, the jaw may be displaced forward and toward the opposite side from that injured. Differentiation is easily made by examining the condition of the tempero mandibular joint. In case of luxation a depression is felt in front of the external auditorius meatus, this is the glenoid fossa, minus its condyle. In case of fracture of the neck of the condyle, this area presents a plain surface, and contraindicates displacement and the differentiation is clearly made out. The radiograph as an aid to diagnosis of fractures of other bones is equally helpful in fractures of the mandible.

### TREATMENT

Methods of treatment of fractures of the mandible are so numerous that it would be unprofitable to present any here except those which experience has shown to be both simple and efficient. Bandages have always occupied a prominent place with surgeons in the treatment of fractures of the jaw, and in a certain small class of cases they will prove an adequate method of treatment. If the fracture is single and near the median line a four tailed, Barton or halter bandage, supporting a neatly fitting boot, adapted to the chin, answers a good purpose. Bandages may also be employed profitably where the break is posterior to the angle, but if the line of severance of the bone is in the region of the bicuspids or molars, and displacement is present, such an immobilizing appliance is impracticable, as no grip on the shorter fragment can be obtained which will hold its end in apposition with the longer fragment, and not infrequently greater displacement of fragments is induced by the pressure of the bandage. The bandage does not as fully immobilize the fragments as do other methods, but only approximate immobilization is essential to early union, indeed when displacement does not exist no appliance is indicated, however the patient must abstain from use of the jaw for mastication when no staying appliance is used.

Oral splinting may be satisfactorily employed in most cases when the fracture is anterior to the first molar, providing a sufficient number of reasonably firmly set teeth remain in the jaw to support a splint.

All modern schools of dentistry give full instruction to its students in the construction of splints for jaw fracture, and if the surgeon decides upon this method of treatment, he should call to his assistance a dentist for the construction and application of the splint.

To construct a splint for mandibular fracture an impression is taken of both lower and upper jaws and teeth. From these plaster of Paris casts are made. If there is displacement, the mandible cast is separated on a line with the fracture or fractures, as the case may be (Fig. 3), and the teeth of these parts occluded with those of the cast of the upper jaw. (Fig. 4.) The parts of the severed lower cast are secured to each other by soft plaster. This gives a reconstructed cast which is a replica of the lower arch before the accident. Upon this may be constructed any form of splint decided upon.

The simplest and least cumbersome splint, if it is efficient, is the one most desirable. Vulcanite is a material well adapted for the construction of splints.

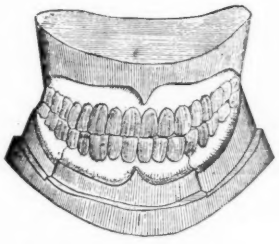

Fig. 4. Reconstructed cast.

Fig. 5. Heath splint cemented to the teeth.

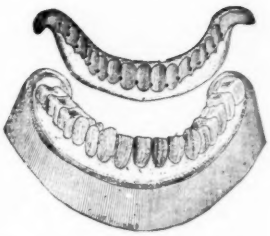

Fig. 6. Posterior band splint.

A thin splint made to cover the teeth of the mandible and so shaped on its upper surface to occlude with the teeth of the maxilla, will, when cemented to the lower teeth, give the ideal splint, since it not only immobilizes the fragments, but permits the normal function of the mandible for mastication. (Fig. 5.) This is known as Heath's splint.

Another splint, which is even more simple than the Heath, is one introduced by the writer many years ago. (Fig. 6.) It is made from vulcanite and is adapted only to the lingual surfaces of the teeth, and wired to them at their necks, through holes drilled in the splint to correspond with the interproximal spaces. This splint also permits the opening and closing of the jaws, but does not permit the use of the jaw for mastication.

Splinting is not practicable in mandibular fractures between the second molar and the condyle. In breaks in this portion of the jaw one of three methods may be employed. First: Wiring the upper to lower teeth, using the upper teeth as a splint. Second: The open method of wiring the fragments to each other. Third: Some form of bandage.

### WIRING THE LOWER TO UPPER TEETH

Of these three methods, providing there are a sufficient number of teeth firmly set in each jaw, the method of wiring the lower to the upper teeth introduced by the writer in 1887, will be found efficient. (Fig. 7.)

For this purpose annealed German silver wire, number 23, is well adapted. It is cut into three inch lengths. The wires are placed around the necks of a sufficient number of teeth on each jaw and twisted tightly on their buccal or labial aspects. The fracture is reduced and the lower teeth are held in their proper occlusion with the upper teeth. The wires of the lower teeth are now secured to the wires of the upper teeth by twisting. As a rule it is not best to attach wires to teeth abutting on the break or those whose sockets are included in the line of fracture, since the pull on such teeth may cause them to be further loosened. Better immobilization is obtained by cross wiring, that is by securing the first wired tooth posterior to the fracture, to the wire on the upper tooth anterior to the break. Likewise the first wire of the lower tooth anterior to the fracture should be secured to the first wire on the upper tooth posterior to the break. This crossing of the wires holds the fragments more closely in approximation and causes less strain on the teeth to which wires are attached.

The principal objection to this method of immobilizing mandibular fractures is the danger in case of emesis. Certainly no such rigid fixation should be employed until all solid food has passed from the stomach and the physical condition of the patient indicates its safety.

As a substitute for the wires as indicated above, thin bands secured to the teeth, both above and below, are sometimes employed. These bands have projections soldered on their buccal or labial aspects and wires are passed from the projections on the bands of the lower teeth to the projections on the bands of the upper teeth, and the fragments immobilized in this manner. In most cases the teeth are so closely set that it is more difficult to apply the bands than it is to apply the wires. This method possesses no advantage over wiring.

Another method of treatment of fractures

Fig. 7. Held in position by wires passed around each fragment of the bone. Method of wiring the lower to the upper teeth.

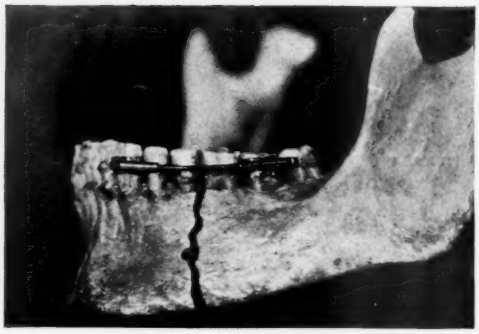

Fig. 8.

anterior to the first molar is to band one or more teeth anterior and posterior to the fracture and connect these bands by a small rod. To these bands tubes are attached horizontally by soldering. Through these tubes the rod, which is threaded is passed. By nuts screwed on the ends of this threaded rod, the two ends of the bone are drawn into approximation. (Fig. 8.) This and the previous method are known as the Angle system.

In edentulous cases, or cases where there are an insufficient number of firmly set teeth in the mandible to support a splint, or to which wires may be secured, as in the method above described, wiring through the bone is the best possible method. This method of treatment, either alone or in combination with splinting, is also demanded where there are several simultaneous breaks in the mandible. In order that sepsis may be avoided, external incision is to be preferred. The incision in the soft parts to expose the bone should be made as nearly as possible under the base of the jaw, in order that the resultant scar may be in the shadow line.

If there is much displacement of the fragment by muscular traction the method of Dr. W. H. G. Logan of drilling two holes in each fragment, one above the other, offers advantages. The two ends of the wire are carried through the two upper holes in the bone toward its lingual side and then the right end of the wire is brought back through the left lower hole and the left end through the right lower hole, and the two twisted so as to accurately approximate the two ends of the bone. This crossing of the wires holds the fragments much more rigidly than when only one set of holes is drilled, or when two wires are used in the four holes. If the tendency to displacement is not great one hole in each fragment is preferable, since there is less injury to the bone.

In either case the twisted ends of the wires should be cut as short as safety will permit and be bent over and smoothed. Well annealed silver wire, number 17, answers a good purpose.

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## A NEW METHOD IN THE MAKING OF A LOWER LIP

By J. F. BALDWIN, A. M., M. D., Columbus, Ohio
Surgeon to Grant Hospital, etc.

DECEMBER 13, 1908, I was consulted by Dr. T. M. G., of Deshler, Ohio, who came in with his friend, Dr. C. E. Beardsley, of Ottawa. Aged 52. Three years previously a cancer had developed on the lower lip. For this he had been operated upon something over a year before by a Toledo surgeon, who had made an extensive operation embracing the entire removal of the lower lip. The operation had extended well into the right cheek, so that the duct of Steno had been involved, resulting in a salivary fistula which lasted for many months.

As healing took place, with the usual cicatricial contraction, the doctor found increasing inability to open the mouth, and complete inability to retain anything in the mouth of a liquid nature. There had been a recurrence of the growth near the angle of the mouth on the right side, but there were no evidences of secondary deposits. The patient was in a condition of most pronounced depression, owing to his deformity and the constant drooling of saliva which rendered him unable to continue the practice of his profession.

I had operated on a considerable number of these cases, and had secured some relief by bringing in tissue from the cheeks in some cases, and in others by borrowing largely from the upper lip to make the lower—the result in the latter cases being an opening resembling very much the mouth of the fish called "sucker." None of these expedients had been by any means satisfactory to myself or to the patients. After studying the doctor's case for several hours, I finally decided upon a technique which I put into effect the next morning.

Operation. The cancerous growth was first thoroughly removed without regard to the subsequent steps of the operation, as ultimate success

required radical removal of the neoplasm. Bands of adhesions on the inside of the mouth were severed, so that the entire cheek could be slid forward, thus getting rid of the depressed scar where the salivary fistula had been. A transverse incision was then made through the scar tissue which had taken the place of the lower lip, this incision being made far enough down so that the scar tissue (a) after being dissected up from below would form the lining of the new lip, in which there would be no hair follicles to make trouble. A second incision, in a general way parallel to the first, was then made about an inch lower, so as to leave the point of the chin (b) as a fixed point to support the lower lip, and particularly because the attachment of the *levator labii inferioris* in this tissue would give the patient considerable control over the lower lip. A third incision was made parallel with the second, and far enough from it so that the bridge of tissue between the two (c) would be ample for the outer layer of the lower lip. This bridge was separated except at the ends and brought above the point of the chin (b) which had been left. With fine silk interrupted stitches the upper edge of the scar tissue, previously carefully dissected up to the line of the teeth and turned up, was attached to the upper edge of the skin flap (c) so as to make the margin of the lip. A longitudinal incision was made downward into the neck, and the two flaps (d, e) which were thus secured were slid forward and slightly rotated so as to take the place of the bridge of tissue which had been used for the lip. On the right side this flap (d) was slid farther up than on the left, so as to fill in the space from which the cancerous growth had been removed. All of the exposed surface was readily covered without tension, and the usual dressings applied. Healing took place by first intention. The accompanying pictures show the appearance of the patient before operation, and after the removal of the dressings and stitches.

The result was most eminently satisfactory, but as healing took place there was a little dropping of the angle of the mouth on the right. This was readily relieved some months later by a slight dissection which enabled me to bring down the fibers of the zygomatic, which had been severed at the original operation, and reinsert them at the angle of the mouth.

The accompanying pictures, with the dotted lines to indicate the different incisions, will render the above description sufficiently intelligible. I report the operation as a new one, since I have been unable, after a somewhat extended search, to find anything like it in any of the text-books or journal articles. It is possible, however, that it has been used before, but without report.

At this time my patient reports that he is perfectly well, without any signs of recurrence, and pursuing happily the ordinary practice of his profession.

# FRACTURE OF THE SPINE; GRAVITY REDUCTION

By F. J. COTTON, M. D., Boston, Massachusetts
First Assistant Surgeon, Boston City Hospital

AND

WILLIAM H. BLANCHARD, M. D., Quincy, Massachusetts
Surgeon for the Fore River Shipbuilding Company

THE reason for reporting this case is not so much the very satisfactory result as the fact that it very well illustrates a principle in treatment of spine fractures to which too little attention has been paid, namely, *gradual reduction of the deformity by gravity.*

Probably this scheme of treatment is old, and it had previously been used by one of us with success in several instances before the occurrence of the case here noted.

It is noteworthy, however, that the method is not described at all among the measures advocated for vertebral fractures. We read much of *forcible* reduction, of *laminectomy*, of simple *fixation*, but nothing of *gravity reduction.*

Nearly all spine fractures ordinarily met with are flexion fractures, fractures in which the force of the indirect trauma, or of the falling weight of the upper part of the body, have determined a fracture of one or another vertebral *body* (usually at about the dorsolumbar junction) with forward displacement of the upper on the lower portion.

This displacement is maintained by gravity and by spastic pull of the muscles, *not* by the contours of the fragments, for the vertebral bodies consist of spongy bone, not of dense bone, and real impaction is probably rare.

If we support the *lower* fragment by appropriate padding, and let the upper portion *drop* back into place, then, as the muscle spasm subsides, we get (in most cases) a very fair reduction of the deformity, and as a rule we probably relieve any narrowing of the vertebral canal that may exist.

In all cases in which a laminectomy seems inadvisable, and in a large share of cases in which laminectomy has already been done, we should place thick heavy pads at either side of the spine *below* the break.

In this way gravity is utilized as an aid to reduction or to the maintenance of position; the undamaged ligaments prevent any danger of overreduction, at least by a force no greater than that of the weight of a part of the trunk.

There is probably no surgeon (of the thinking sort) who is not sick of doing routine laminectomies, uncertain of indication as well as result, and most of us have been chary of forcible correction because of the risk of calamitous cord pressure from overreduction.

It is believed by the writers that gravity reduction, carefully handled, will take the place in many cases of the more forcible measures, and in many cases will do all that laminectomy can accomplish.

H. M., aged 36, previously healthy and robust, an expert machinist, was engaged in installing an ammunition hoist at the works of the Fore River Co., when the carrier, weighing about 1,800 pounds, fell on him from a height of about 8 feet, striking him on the neck and shoulders, and crushing him down into the pit. He was doubled forward, and he says he felt his back give way, distinctly.

This happened on November 29, 1909. He was helped out of the pit (after the weight was hoisted), in great pain but able to help himself in part, and was immediately taken to the hospital maintained by the company.

He was conscious, suffering a good deal of pain in the back.

There was a contusion on the back of his head, and there was deformity, with an obvious hematoma, at the junction of the dorsal and lumbar spines.

The pain was severe enough to require one-fourth grain of morphine sulphate, and the shock was very considerable. The pulse ran to 130, the temperature to 100°. After administration of one-thirtieth grain of strychnia he rallied somewhat. There were no obvious paralyses, and no loss of sensation.

Three hours after the injury he was seen by Dr. Cotton in consultation with Dr. Blanchard and with Dr. Bartlett of Norfolk Downs. His condition was unchanged. He complained of much pain in the back, but of no radiating pains suggesting nerve root compression. Sensation was everywhere normal, and all motions were normal (except for motions checked because they produced pain in the back). Sphincter control seemed to be undisturbed.

On turning him over cautiously, moderate swelling (with distinct ecchymosis) was evident at the dorsolumbar junction. At this point one vertebral spine (2d lumbar) was very prominent, projecting backward at least three-fourths inch below the first lumbar spine.

His back showed also an abnormal *convex curve* in this region, a kyphosis.

There were no bony fragments that could be moved.

There were no signs of nerve root compression and there was absolutely nothing to show for any pressure on the cord; not only were sensation and motion undisturbed, but all reflexes were normal.

There was no sign of damage to pelvis or chest; there was some general soreness of the abdomen but no indication of injury to viscera. There was some soreness in the perineum, apparently urethral.

It was felt that laminectomy was not called for, and in view of the considerable displacement it was felt that immediate forcible attempts to reduce the deformity might carry a considerable risk of trauma to the cord. Moreover there was no actual hurry.

Accordingly, we decided to try *gravity reduction*. This was done by placing on either side of the spine *below the fracture* long narrow sandbags, which with their coverings of folded sheets were about three inches thick. This accomplished a moderate amount of hyperextension, or rather of obliteration of the abnormal convex curve. There was no immediate reduction of the displacement.

The treatment was not comfortable, and we had to satisfy ourselves with somewhat less padding than we could have wished. To control the pain in the back one-fourth grain more of morphine was given by mouth. The patient's general condition was not good.

Six hours after he was hurt he had a temperature of 102° and was very thirsty and rather restless. Pulse was only 102, however, and respirations normal. Could not pass urine, catheterized, urine negative. Voluntary (and frequent) urination returned next morning.

Next morning, the temperature was 101°, pulse 100, and he was resting more quietly. Unsatisfactory result of enemata, beginning distension.

The hyperextension pads were thickened, with no increase of discomfort.

Through the day the pain called for administration of three-fourths grain morphine in all, but his condition was good and that night he was tolerably comfortable, though the abdomen was somewhat distended.

Next day (November 31st) he vomited his breakfast, and though quiet enough during the day he became restless in the evening, and the abdomen rapidly became more distended. Enemata had no effect.

December 1, 1909. The bowels were still greatly distended, and beside the distension and some vomiting we had a persistent hiccough to deal with. All sorts of purgatives and enemata were tried in vain. The pulse was good, but respiration much embarrassed by the extreme distension. He looked and felt very badly. After most persistent and protracted effort of all sorts the bowels were started a little on this, the *fourth*, day. Next day bowel movements were readily started by enemata and the distension was relieved. In spite of this relief the patient grew more restless (evidently from toxæmia) and later became delirious, and his pulse "went to pieces" with unaccountable speed; a prominent factor in wearing him out was the hiccough that had never wholly stopped and now grew worse.

Presently inhalation of chloroform was successfully resorted to, to check the hiccough. This had to be repeated several times. Under constant use of milk and molasses enemata the distension was held under control. It was not, however, until the sixth day that the distension was fully relieved and the hiccough entirely gone. Not until the twelfth day did the pulse and respiration come to normal.

For several days the condition was so critical from the abdominal condition that the back was almost let alone save for adjustment of the pads. On the fourth day (December 1st) however, examination showed that the whole of the obvious deformity had disappeared. From this time on there were no local signs save for soreness and traces of the hematoma.

The pads under the lower portion of the lumbar spine were continued and even slightly raised from time to time. The arrangement was never particularly comfortable, and the patient was greatly pleased to be able to be put into a plaster of Paris jacket on the twenty-second day.

This was applied in the usual way on a "Bradford frame" with a canvas suspension hammock; in this case it was so applied as to give a maximum lordosis, with hips and upper chest included in the jacket and very snugly held.

On the 27th of December he could sit up somewhat, without pain, and was able to be taken by train to South Bethlehem, Pa., under escort of one of us (Blanchard), and stood the trip perfectly well.

Soon after his arrival there he passed into the hands of Dr. P. E. Stem, of South Bethlehem, Pa.

Dr. Stem writes under date of June 18, 1910, "In regard to Mr. M., I can say that he has made a fine recovery and has been at work for the last four weeks. I had a body brace made for him by Chas. Lentz and Sons, of Philadelphia; my assistant removed the plaster cast and put on the brace, and he has not since complained of pain, and walks to and from his work with the use of a cane without any inconvenience. There is no deformity of any kind, in fact I have not been able to locate the fracture. It is without doubt a remarkable recovery."

Under date of December 2, 1910, the patient himself reports, "don't call me cripple, there is no cripple about me. I am all O. K., and going same as I always did, and doing the same work that I did before, and got a raise in wages about two months ago, don't look like a cripple! I worked every day since the 15th of May and believe I could lift one thousands pounds if necessary. I am still wearing my jacket when I am at work, but get it off most of the time when I am home."

We have here a practically complete recovery from a very severe vertebral lesion. Such recoveries are not at all unknown. The point to be emphasized in this case is that reduction, probably impossible by forcible manipulation, perhaps hardly possible with laminectomy and forcible manipulation, was in this case accomplished by *gravity reduction*.

One could ask no better end result, but the man "came by" with a very small margin, and it may fairly be questioned whether either forcible reduction or open operation would not have obliterated this margin.

Just what the reason is for the intestinal torpor (not uncommonly seen in these spinal injuries), that compromised the issue in this instance, we are not prepared to say.

All there is to say is that this man recovered admirably under this mode of treatment, and we do not believe he would have done so well by other methods.

So far as it goes the case argues for the method of gravity reduction in spine lesions without cord pressure.

# TRANSACTIONS OF SOCIETIES

## CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD JANUARY 20, 1911, WITH THE PRESIDENT, DR. GUSTAV KOLISCHER, IN THE CHAIR

### A CASE OF CONGENITAL MALFORMATION OF THE RECTUM

BY DANIEL N. EISENDRATH, M. D., CHICAGO, ILLINOIS

A glance at Fig. 1 will recall to the members of the Society the different varieties of congenital malformations of the rectum. The most important of these are the forms (a) in which the hind-gut closely approaches the proctodeum, but is separated from it by a thin membrane; (b) the form in which the hind-gut terminates close to the promontory of the sacrum or a little below it, and is separated by an interval of several inches from the proctodeum; (c) the form in which the hind-gut terminates either in the bladder, urethra, or vagina. The case which I propose to report belongs to this third variety. A history of the case is as follows:

Frances G., was admitted to the service of the writer at the Cook County Hospital in December, 1909. Her chief complaint was that defecation had occurred since birth entirely through the vagina, and that she had entered the hospital for the purpose of having this condition corrected. Examination upon admission showed that there was absolutely no trace of any formation of an anus. There were a few folds of skin corresponding to the normal crenæ ani and a slight pigmentation of the skin. These folds of skin radiated from a central slightly depressed area of skin, but there were no signs of any lumen, the skin being perfectly smooth and intact. Vaginal examination showed a most remarkable condition. The patient had a complete division of the uterus, there being two separate bodies and two separate cervices. One of the most remarkable features of this congenital malformation of the genitalia was that the septum, which was transverse, formed a double vagina. This septum was covered on both sides with mucous membrane and extended down to the vulvar orifice. I mention this fact

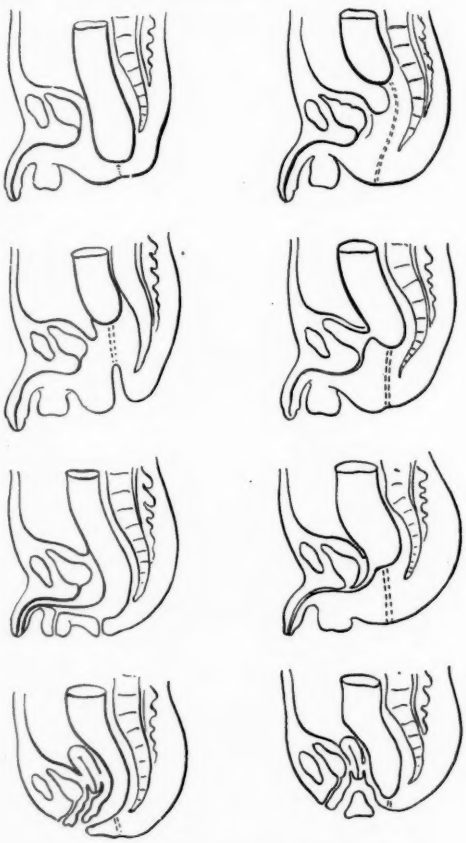

Fig. 1. Types of imperforate anus.

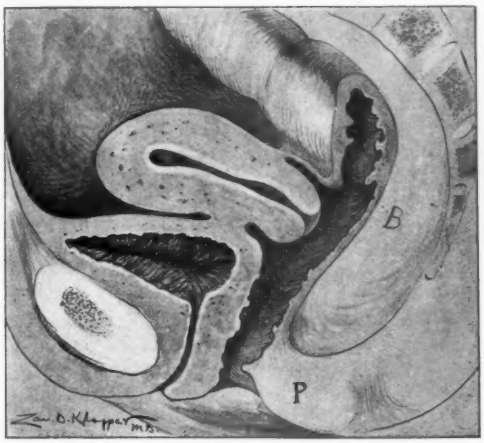


Fig. 2. The double uterine and double vaginal features of this case are omitted in all of these illustrations for purposes of simplicity. This illustration shows the distance between the vaginal opening of the anus (B) as it originally existed and the perineum (P) where the rectum should terminate.

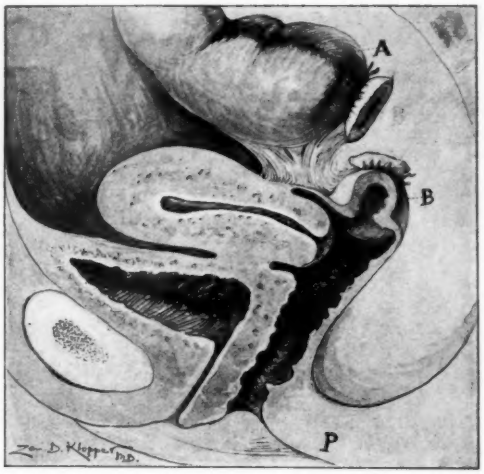


Fig. 3. View of the parts just after division of the rectum. (A) Proximal segment of rectum and sigmoid not yet separated from its mesentery. This illustration shows the condition just before the proximal segment was brought down through the cutaneous opening in the perineum (P). (B) Distal end of rectum, showing closed proximal end and open vaginal end.

because the most frequent form of double vagina is that in which the septum is a vertical one instead of a horizontal or nearly horizontal one, as in this case. Into the posterior of these two vaginæ and somewhat to the left of the median line the rectum emptied, at a distance of approximately four inches from the vulvar orifice. The vaginal opening of the anus was about the size of a silver half dollar, and on inserting one's finger through it one could find an ampulla-like enlargement, in which hardened fecal masses lay. The distance between the perineum, where the anal opening ought to be, and the vaginal anal opening was also about four inches. At the time of operation the patient was eighteen years of age. The menstrual history had presented no unusual features. She was a very well developed girl and there were no other malformations present. There was no history of any malformations in the family.

The operation was performed about one week after admission and consisted, in brief, as will be seen by reference to the accompanying illustrations, of dividing the rectum just above its opening into the vagina transversely, freeing it of its accompanying mesorectum and mesosigmoid, and bringing it down through an opening made artificially in the skin of the perineum corresponding to the normal position of the anus. The details of the operation are as follows:

An incision was first made through the skin of the perineum where the normal anus should be. A small bit of tissue, resembling somewhat mucous membrane, was found here, but there were no traces of any lumen. There was, however, just beneath the skin a muscular structure which resembled in every particular the normal external sphincter, being parallel to the skin, and surrounding this small mass of mucous tissue just referred to. It was seen that in order to bring down the rectum it would be necessary to perform a laparotomy. Upon opening the abdomen a double uterus was seen, two separate bodies extending down towards the cervix. To the left of the posterior of these two bodies the rectum opened very broadly into the upper portion of the posterior of the two vaginæ. The mesorectum was extremely vascular and it was deemed inadvisable, on account of the inaccessibility of the parts, to excise the vaginal termination of the rectum *in toto* and transplant it in this manner into the perineum. Any attempt to have brought down the rectum without performing a laparotomy would undoubtedly have resulted fatally, owing to the great vascularity and shortness of the mesorectum. After clamping off the mesorectum the rectum proper was transversely divided (see Fig. 3), the distal end (b) was ligated

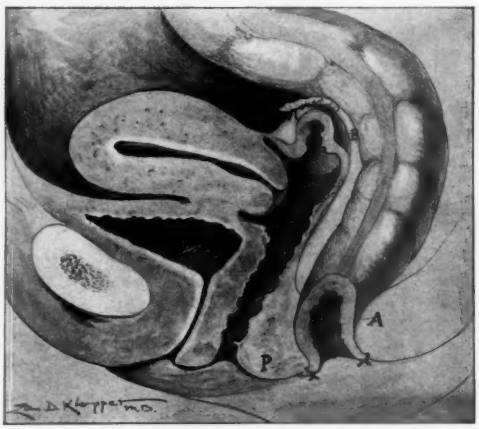


Fig. 4. (B) Terminal segment of the original rectum ligated with catgut, and proximal end closed with Lembert silk sutures. The distal end, that is, the vaginal opening of the original anus, was left open, it being located so high up that it was impossible to reach it from the vulvar orifice. (A) Transplanted rectum, opening at location where anus ought to be. (P) Perineal body.

with catgut and the stump covered with a Lembert silk suture. Attempt was made to bring down the proximal portion (a) after freeing it from its posterior attachments, but this was impossible, owing to the great distance between the vaginal opening of the anus and the location to which we wished to bring it. It was necessary, therefore, to take advantage of the researches into the collateral circulation of the sigmoid. These investigations show that an artery sufficient to maintain the blood supply of the sigmoid passes parallel to the long axis of the gut, so that it is possible to separate the sigmoid from its mesentery for a distance of six to eight inches without danger of gangrene. I made use of this similarly to the manner in which one performs an abdominal extirpation of the rectum, by ligating the mesosigmoid for a distance of about four to five inches, so that the entire length of movable gut, sigmoid, and rectum was now about six to seven inches. This is represented in Fig. 3 by (a). Fig. 4 shows the final steps. The distal portion having been closed in the manner just described, the proximal portion (a) was carried through the pelvic fascia and levator ani muscle lining the floor of the pelvis, and brought through an incision previously made to explore the extent of the proctodeum. Great care was taken to allow for sloughing of some of this transposed gut by bringing the peritoneal surface directly in contact with the skin tissues, so that the entire thickness of the gut projected for about a half an inch beyond the margins of the cutaneous incision. The gut was sutured to the adjacent skin with catgut sutures.

Recovery from the operation for the first few weeks was uneventful. Later a periproctitic abscess formed, which was quite obstinate to treatment, but which finally healed. This was due to the sloughing of some of the lower end of the gut along the posterior margin of the newly-formed anus.

Examination about six months after operation (in the fall of 1910) showed that continence was perfect, except when the patient took saline laxatives. She is able to hold both feces and flatus, and there are no signs of any incontinence.

Examination in January, 1911, showed that there was no stenosis at the newly-formed anus; the finger inserted through the anal margin encountered normal mucous membrane. Vaginal examination showed that the pouch corresponding to the original location of the vaginal anus still existed, and in it were some inspissated masses of mucus, which had a distinctly fecal odor. Every effort was made to determine whether there was any communication between the old vaginal anus and the rectum, but apparently none existed. The fecal odor in the remnants of the vaginal anus could be best explained by the fact that colon bacilli still existed in the mucous membrane of the terminal segment which had been left about one inch long, and that the inspissated masses above referred to were mucus containing colon bacilli.

Dr. H. Schiller, of this city, has informed the writer that he has seen abroad a case similar to the one reported, in which this fecal odor persisted in the terminal segment and could only be explained upon the preceding basis.

### DISCUSSION

Dr. C. S. Bacon: I want to congratulate Dr. Eisendrath on the excellent result obtained in this case. I would like to ask him, what is the proportion of cases in which the vaginal septum is horizontal? There evidently was some laceration. I have never seen a case like this, although I have had two cases of imperforate anus in babies.

I would also like to have him tell us about the menstrual history of this patient.

Dr. Gustav Kolischer: These malformations are very rare. Some years ago Frank published a paper on this subject in which he reviewed the literature and also discovered mu-

seum specimens at his command. He mentioned a few points which are important as bearing on the etiology and treatment of these cases. One of the important points he emphasized is that the internal sphincter of the rectum always adheres around the abnormal opening. Therefore, he suggests that in operating we should be very careful in making an excision of the rectum, excising the entire mouth of the rectum where it opens into the vagina, and transplant this whole structure into the anal opening. Thus the occurrence of a fistula is avoided and there will be perfect continence. He suggested two ways of doing this operation: First, to split the perineum, and, second, to do a modified Kraske, excising the coccyx so that the pelvis is laid wide open, enabling one to operate without interfering with the continuity of the rectum. The rectum thus becomes absolutely movable without sacrificing any of the mesorectum. The sigmoid is then also accessible. He proved the value of his suggestion by operating successfully in this manner. He went through the perineum, imbricated the rectum with its internal sphincter into the perineum, and the two cases in which this was done proved entirely successful, although the patients were children.

As to the vaginal septum, I have been impressed by this fact. Horizontal division of the vagina is not to be regarded as a duplex vagina. I think it is simply the edge of the vagina, which is apparent if we consider the fact that the pelvic outlet is forced or pushed through three layers of fascia. If the rectum is not pushed through its normal opening, but through the vagina, there is not a septum in the usual acceptance of the term.

Dr. Eisendrath (closing): I do not know anything about the girl's menstrual history. The thing that interested me particularly in the case was this rectal condition. She says, however, that since the operation her menstruations are irregular.

With regard to the septum, we divided it. It was covered on both sides with mucosa, almost to the vulvar orifice. Shortly before she left the hospital we clamped the sinus with twenty-eight inch forceps and then divided it between the forceps, so that the septum as it is to-day does not represent more than one-third its original length.

As to transplanting the entire section, as mentioned by Dr. Kolischer, that occurred to me at the time of operating, but I thought it inadvisable to do so on account of the extreme vascularity and the unusual inaccessibility of the bowel that would be the case in an abdominal extirpation of the rectum. Therefore, I contented myself with making the section as I did.

In regard to the perineal operation, that was out of the question here because it would have entailed tremendous mutilation of tissue, on account of the opening being so high up. It would have been necessary to split the entire posterior vaginal wall almost up to the cervix, in order to reach the rectum. I certainly would not advise undertaking such a case as this through the perineum.

## EXHIBITION OF SPECIMENS

### I. Scirrhous Carcinoma of the Ovary. II. Multiple Fibromata of the Uterus with a Four and a Half to Five Months' Pregnancy. III. Multiple Fibroma of the Uterus; Porro at Term. IV. Uterus, Ovaries, and Tubes Removed. Postmortem about Ten Days after Labor

By THOMAS J. WATKINS, M. D.

1. Scirrhous carcinoma of the ovary.

The sections are from a solid hard tumor about one inch in diameter in the central portion of an ovary. The patient had recently been confined and had chronic appendicitis, retroflexion of the uterus and the tumor exhibited. Dr. Robert F. Zeit, who examined the sections, said that it was somewhat uncertain as to whether it should be classified as an endothelioma or a scirrhous carcinoma.

2. Multiple fibromata of the uterus with a four and a half to five months' pregnancy.

This uterus was removed with the fœtus in situ. The indication for operation is the character of the tumor. As can be seen in the specimen, the tumor involved about three quarters of the body of the uterus so that the pregnancy was developing in about one quarter of the uterine body. It was consequently considered dangerous to allow the pregnancy to continue.

3. Multiple fibroma of the uterus; Porro at term.

The specimen shows beautifully the appear-

ance of the placenta and membranes in situ at term. The largest fibroma, about 3 or 4 inches in diameter, is located low down on the posterior wall of the uterus and made delivery by the vagina impossible without removal of the tumor. Gestation went on to term without much inconvenience and a Porro was made before labor commenced.

4. *Uterus, ovaries, and tubes removed, postmortem about ten days after labor.*

The patient was confined by a midwife and brought to the hospital 8 days after labor in a moribund condition. The only abnormal local findings were swelling, redness, pain, and acute tenderness about the elbows and right knee.

The general findings were those of a very virulent systemic infection.

On autopsy, as shown by the specimen, the uterus, ovaries, tubes, and peritoneum appeared about normal. There are no signs of an inflammatory reaction and no thrombosis of the vessels. The lymphatics appear normal.

Cultures from the cavity of the uterus showed streptococci and staphylococci. The elbows and the left knee showed acute edema with very little cell infiltration and no visible thrombi. The periosteum and bone were not involved in the local inflammatory process. Cultures from the heart and edematous areas showed streptococci.

The case is of special interest on account of the apparent normal macroscopic appearance of the pelvic structures and peritoneum in a very virulent streptococcic puerperal infection.

DISCUSSION

DR. FRANK W. LYNCH: The difficulty of correct diagnosis in the case of Dr. Watkins' ovarian tumor suggests a perplexing case which recently came under my observation.

A woman came to me stating that a physician had told her that she had a "tumor of cancerous tendencies" for which she must be operated. I found on examination no evidences of a tumor. The uterus was in good position and of normal size and outline. The pelvis was free. There was however an extremely large cervical laceration, and a marked cystocele and rectocele for which I advised operation. Accordingly we did the necessary plastic work, and a few days later were considerably disturbed to find that sections from the cervix showed that we had cut through a very small adenoma in the amputation. This tumor was of the size of a match head and presented no evidence of malignant change. Yet we have advised a secondary operation because we believe that there is a very considerable chance that this tumor will later become malignant. If it does so, there is but the smallest chance that we could detect it while still operable. From its present position, covered everywhere with normal epithelium, it is more than likely to first grow outwards toward the parametrium and give metastases before signs of growth could be detected by the usual methods of examination. We have advised the secondary operation merely because we believe that there are more chances that the tumor will become malignant and in this case, consequently fatal, than for death to occur from the operation. We have explained that the tumor as it stands is termed a benign growth.

This case is of interest in that the patient really had a "tumor of cancerous tendencies," although, inasmuch as no scrapings had been made, the first diagnosis was but a lucky guess.

Dr. Watkins' specimen of uterine puerperal infection emphasizes the necessity of taking uterine cultures and the uselessness of local treatment in cases which do not present retained placenta. Sections from the uterine wall of similar specimens show great quantities of streptococci progressing through the lymphatics even to the outer wall of the uterus. The futility of local treatment is apparent in such cases.

DR. FRANK W. LYNCH read a paper entitled "Bradycardia of the Puerperium." (See p. 441.)

DISCUSSION

DR. C. S. BACON: The importance of a clear definition in these cases cannot be overstated. We must say whether we mean a slow pulse or a retarded pulse, and to do this we must determine the pulse rate before pregnancy as well as during pregnancy. Most observers have not taken that fact into consideration. Dr. Lynch's series of observations is the largest and the most carefully made on record. It is evident that we can never decide definitely whether there is such a thing as a retarded pulse during the puerperium unless we know the rate during pregnancy. Then, too, we should know the normal pulse rate of the woman prior to her pregnancy. That would give us a complete record. Dr. Lynch says that the pulse rate has increased during the pregnancy and that it drops back during the puerperium. That is undoubtedly true, although Heil found only ten or twelve per cent of cases of retardation, while Dr. Lynch found a large number. I would like to ask him whether his cases of slow pulse were really such, or whether there was a double

pulse, one beat being faint and uncountable? Fehling made that point, and it is an important one.

There is also very frequently in these cases an arrhythmia. Dr. Lynch did not speak of that in his paper. Someone in the Vienna clinic and others elsewhere showed that a certain proportion of cases of retardation are associated with arrhythmia, which is frequently due to a very weakened pulse, so that it cannot be felt by the palpating finger, although it is plainly shown by the sphygmograph. It is interesting to note that in many of these cases there was no change mentioned on the patient's arising. Some time ago I was inclined to attribute some of these findings to a change in nutrition. Someone stated that a low diet during the puerperium has something to do with a slow pulse. I have seen very few cases of markedly slow pulse, and I have wondered whether that was due to the fact that I feed my patients very well.

I would like to suggest a possible cause for retardation of the pulse, one which I have not seen mentioned by anyone. It at least is interesting theoretically. Professor Dreyer, of our school, spoke to me about it. One of the theories is that the influence of some of the products of metabolism, as Olshausen suggested, the changes going on in the uterus and being taken into the circulation, had some effect, possibly stimulating the vagus. Professor Dreyer suggested that it was possible that the potash salts were the cause of this. The theory of Heyl as to the influence of potassium on the heart muscle would have to be considered in this connection. It is quite probable that in the retrogressive metabolism an increase in the potassium salts occurs. This could be proven by giving calcium in combination and reducing the amount of potassium.

Dr. W. B. Fehring: We must take into consideration the changes in metabolism following labor. Lactose occurs in the blood. There is probably a marked alteration of the liver function, of the glycogenic function. Labor draws heavily upon the glycogen store of the body. Autolysis occurs and we frequently find peptonuria. For the sake of comparison we might study cases of catarrhal jaundice where there is a marked slowing of the pulse, due to the circulation of the bile acids or their salts in the blood. The direct stimulation of the vagus by the action of these salts as they reach the brain, or by their action directly on the heart muscle or cardiac ganglia, or the intrinsic nerves of the heart, may be the source of inhibition of the heart beat. To get at the matter accurately, it would be necessary to know definitely the patient's state of health when not pregnant and when pregnant.

Lewissohn (Berlin) reported 295 cases, with thirty-odd cases of non-puerperal women.

He attributes the bradycardia to the diminished amount of blood passing through the heart; in consequence of lowered metabolism there is less automatic stimulation of the heart's action.

However, he does not state definitely the exact knowledge as to the patient's condition in the non-pregnant state or during the months before the puerperium.

Dr. George Schmauch: There seems to be a general agreement that retardation of the pulse takes place in the puerperium, and there are several reasons for this. There is no doubt that there are exceptional cases of very slow pulse, even in healthy women. Olshausen's theory considered the fatty degeneration which takes place in the uterus after delivery, and the absorption of these products. I do not think that potassium has so much to do with it. We do not need to look for strange causes, because there are so many well known causes that are more apt to bring on a slowing of the pulse. Pregnancy cannot take place without an immense production of lecithin. This lecithin is reduced in the puerperium to cholesterin and cholin. Cholin has a marked influence on the pulse rate. One of the best medicines to bring on abortion is cholesterin. Used in animals experimentally it invariably produced abortion, as shown by Hofbauer. I think the findings speak more in favor of these liver products as having an influence on the pulse than any other cause.

One fact was mentioned, namely, that we very rarely find a greater reduction of the pulse in primipara than in multipara. It can only be explained by assuming a different function of the organs having internal secretion, such as the thyroid and suprarenals. It is greater probably in the multipara than in the primipara in whom these organs are not so well developed and where more antagonistic organs come into play.

Dr. M. Goldstine: I should think that in these cases, where the pulse slows down in the puerperium and where it presents for a number of days, it is probably the normal pulse, because in severe cases of bradycardia the pulse rises under stimulation of drugs before the patient died. I think the most common cause might be the lowering of the abdominal pressure incident to the

delivery of the child. It was my good fortune to be an anæsthetist in many hundred cases, and I have noticed that in cases of large tumors in the abdomen there was a marked slowing of the pulse when the abdomen was opened and the tumor delivered, so much so in fact, that it was serious to continue the anæsthesia. Therefore, before the abdomen was opened I stopped the anæsthesia and the bradycardia did not occur. I noticed the same thing in Cæsarean sections, especially when the uterus was delivered before it was opened. I believe that this theory might be supported, especially in the case of triplets, reported by Dr. Lynch, where there was such a marked slowing of the pulse, the rate going as low as 30. In that case there was a marked lowering of the intra-abdominal tension.

Dr. Lynch (closing): Dr. Goldstine's remarks are very interesting. In many cases where I have had the opportunity of feeling the pulse immediately preceding birth, and shortly after, I have noticed a considerable fall in the pulse rate. While we used at that time a Riva Rocci instrument yet we have found that its reading — systolic only — is fairly accurate, provided only that the blood pressure is well within normal limits. As you know, labor pains cause a momentary rise in blood pressure, as do intrauterine manipulations, these latter to a very considerable extent. There is but little doubt but that we missed many of the primary falls in our report, at least if they were very transient, by making only one pulse count and that at a fixed hour of the day. In working up my notes I considered incorporating with them the nurses' records which were made every four hours. After due consideration we dismissed this possibility even though it seemed inviting, as the nurses were extremely intelligent, faithful, and interested in medicine, and there was but remote chance that any of their records would have proven fictitious.

It has been a regret that I could not obtain the pulse record of a considerable number of normal non-pregnant women in bed to form a rough control as to what constitutes the average pulse of this class of cases. Yet opportunity was not afforded for this by the hospital, as the interval between admission and operation was extremely short in women with minor ailments in the gynecological wards, and those on the medical service presented pathology of a character that would be apt to influence the pulse rate. In this connection I wish to acknowledge the justice of Dr. Bacon's criticism of my statement that it would appear that the pulse was elevated in pregnancy, rather than depressed during the puerperium. Of this of course, I have no proof, nor is such a statement incorporated in the paper, but was made extemporaneously in speaking of Heil's work. What I wished to say was that there was a strong suggestion of this from Heil's work. Dr. Bacon's mention of the frequency of arrhythmia in slow pulses is very interesting. In our series we made it a rule to count all very slow pulses with the stethoscope, and nearly all pulses well down in the 50's were found to present some irregularity of the heart action.

As to the diet, nearly all of these cases were given the old-fashioned restricted diet which I am glad to see going out of vogue.

The theory of the influence of the salts which are thrown into the circulation during the involution of the uterus is extremely interesting. We know that the uterus is digested very largely during the first ten days of the puerperium, and as a result much additional nitrogen can be found in the urine excreted during that period. That this is nitrogen which is derived from the involution of the uterus is proven, I think by the fact that the nitrogen curve after a Porro-Cæsarean does not show the excess of nitrogen that is seen following normal labors, in the cases where the nitrogen of the food is carefully estimated so that one may be able to talk intelligently about the nitrogen balance. Why should not these tissue salts be thrown into the circulation?

I hesitated to draw many conclusions from this paper as I have already stated. In fact had the article been sent to the printer and not read, I doubt whether I should have drawn any. Yet I wish again to mention one suggestion which has constantly appeared to me, and that is that the pulse in pregnancy seems to indicate that pregnancy exerts a strong toxic effect on the maternal organism, especially marked in the primipara. It would almost suggest that a small grade of immunity was conferred by one pregnancy, as the pulse of multipara during pregnancy did not usually present the wide variations of the primipara. This suggestion falls in line with the known fact that the pregnant animal is more susceptible to toxic influences than the non-pregnant animal, that eclampsia is more common in the first pregnancy, etc. While we have had no cases of multiple pregnancy included in our statistics there were two cases of twin pregnancies in the series, both of which had to be excluded because of the advent of complications, which were apt to influence the pulse rate. The pulse during pregnancy in both cases ran very high and if I recall correctly averaged more than 105 in each instance.

# ABSTRACTS OF CURRENT LITERATURE

## DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

FREDERIC A. BESLEY, M. D.

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| GEORGE E. BEILBY, M. D. | WM. R. CUBBINS, M. D. | AIMÉ PAUL HEINECK, M. D. |
| J. S. EISENSTAEDT, M. D. | FREDERICK G. DYAS, M. D. | G. T. COURTENAY, M. D. |
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| ARTHUR B. EUSTACE, M. D. | JOHN A. WOLFER, M. D. | H. A. POTTS, M. D. |

**The Results Obtained by Autogenous Vaccines in Various Urinary Infections.** J. T. GERAGHTY. *Transactions of the Congress of American Physicians and Surgeons*, vol. viii, 271.

In order to make an adequate test of the value of vaccines in the treatment of infections of the urinary tract, Geraghty selected thirteen cases which had been under observation for a long time and which resisted all efforts to dislodge the infection. The treatment was not employed on any patient with an acute infection, or in whom the disease was of short duration and the patient only a brief time under observation. Cases of this type the author believes are misleading, for if improvement or cure results, one is apt to attribute the improvement to the vaccines when they have played absolutely no rôle.

Of the thirteen cases studied, four were renal infections, all due to the colon bacillus, one was a case of double pyelitis, two pyelonephritis, and one of bacilluria. Vaccines were prepared in each instance from the patient's own organism and injections from 200 to 500 million bacilli given at weekly intervals. No improvement was noted in any case, though the injections were continued from three to six months. In six cases of mild cystitis, the colon bacillus was isolated in pure culture in three, in one the bacillus lactis aerogenes, in another the staphylococcus albus, and in the sixth case the colon bacillus and staphylococcus albus were combined. There were three cases of persistent bacteriuria, in two of which the micrococcus urea was obtained, and in the third one the micrococcus urea and colon bacillus were combined. The author considered that the two cases of mixed infection were particularly suited to test the efficiency of vaccine therapy, for he reasoned that if there was any specificity in the treatment, it ought to be possible by using vaccine prepared from one of the organisms concerned in the infection to eliminate this organism, leaving the other organism behind. Accordingly he prepared a vaccine from one of the organisms. In neither case were any results obtained, though injections were given regularly and varying sized doses employed. Later the other organism was isolated in each case, vaccines prepared and injections given at regular intervals over many months without any appreciable effect. The result where only one organism was concerned was just as disappointing. No attempt was made by the author to follow the opsonic index, as he considered the method too variable to place dependence upon the determinations.

In concluding his study of these cases, Geraghty states that in not a single instance was any improvement produced which could in any way be attributed to the vaccine theraphy. GEORGE E. BEILBY.

**Passive Hyperemia of the Extremities—A Simple Method of Conservation of the Blood and Chloroform During Operation** (Die Extremitaetenstauung, eine einefache Methode zur Blut- und Chloroform ersparniss bei Operationen an anderen Koerperteilen). HANS HANS. *Zentralbl. f. Chir.*, 1910, xxxvii, 1579.

Hyperemia of the extremities produced by application of an Esmarch bandage to legs and arms during general anæsthesia has had the following results:

1. Lesser hæmorrhage in operations on head, neck, torso, in delivery, and in internal hæmorrhages.

2. Less chloroform or ether is needed.

3. By loosening the stenosing bandage a very energetic auto-transfusion can be effected in case of need and for quicker awakening.

Thin rubber tubes or hose is put on near the axillæ and groins, and anæsthesia is given only after a blue-red cyanosis, in which the circulation has almost entirely stopped, is effected. The cells of the cerebrum are sufficiently affected by a much smaller quantity of chloroform, because it affects only head and trunk. In a too profound anæsthesia a considerably increased deposit of uncontaminated blood is accumulated in the extremities, which can be released at any time to fill up and increase the low heart tonus. In younger and fat people a stronger, and in elderly and meager people a lesser pressure is applied. By the slow swelling of the limbs the bandage becomes more and more

tightened and should be put on loosely for operations lasting longer than one-half hour. In untying the bandages there is just as little danger for later hæmorrhage as by injections of physiologic salt solution.

In anemia low position of the head, and in arterial sclerosis a very light application, is indicated.

No regular influence upon the heart pressure could be found by the use of Gärtner's tonometer.

F. G. DYAS.

**Fever in Malignant Renal and Adrenal Tumors.** JAMES ISREAL. *Deut. med. Wochenschrift*, i, January 12, 1911.

Isreal calls attention to the following facts:

Malignant renal and suprarenal tumors can run a febrile course wholly independent of any fever producing complication. It may make its appearance at various stages of the disease as initial, intercurrent, or final fever. The initial fever may appear as the first and only symptom, or it may be coincident with the first evidence of presence of tumor. The intercurrent fever may appear at any time in the already manifest condition. The final fever appears as the end stage of cachexia and the metastatic process. The fever shows, with the exception of the irregular atypical forms, three fairly marked types: (a) Febris hectica, (b) febris recurrens, (c) fever either preceding or immediately following hematuria. The temperature rise is wholly independent of bacterial decomposition or of necrotic processes going on in the tumor mass. It is present in all varieties of malignant neoplasms regardless of their histological structure. Rapid growth, propagation into the fat capsule, veins, and adjacent tissues appear to be factors in the production of fever in renal tumors, but are not to be considered essential for its presence.

J. S. EISENSTAEDT.

**Traumatic Polyuria** (Über die traumatische Polyuri). DR. ERNST SCHÜMANN. *Mitteil a. d. Grenzgebeit. d. Med. u. Chirurg.*, vol. xxi, No. 5.

Polyuria may result from primary disease of nerve substance, as brain tumor, embolism, and apoplexy, cysticercus, tuberculosis, gumma, carcinoma of the pineal gland, and hypophysis. Aside from these causes we have polyuria due to trauma to the head and clinically this condition is not to be differentiated from diabetes insipidus.

The polyuria due to trauma most often ceases spontaneously as does diabetes insipidus at times.

From the number of traumatisms to the head it must be concluded that polyuria is not a usual symptom.

Gerhardt concluded that it resulted most often from injuries to the posterior fossa, and followed a *severe* "shaking-up" of the brain substance, and in cases which had remained unconscious for a long time.

Upon the return of consciousness the patients suffered a severe thirst and showed a marked polydipsia which Nothnagel concluded to be the primary change in diabetes insipidus. Quite frequently traumatic polyuria is followed by glycosuria which is usually of short duration.

According to the author the duration of traumatic polyuria is two to three months, but cases have been known to persist for years.

In reviewing the cases which have gone to autopsy he concludes that traumatic polyuria cannot be classed as a positive symptom of injury to the pons and medulla, also that we cannot look upon it as a focal symptom of cerebral traumatism and that little weight should be placed upon it as a topical diagnostic sign.

H. A. POTTS.

**The Clinical Picture and Treatment of Stones in the Pelvic Portion of the Ureter** (Klinik und Therapie der Steine im Beckenteile des Ureters). DR. FRIEDRICH NECKER AND DR. KARL GAGSTATTER. *Wien. klin. Wchnschr.*, 1911, xxiv, 268.

This consists of a report of sixteen cases from which the writers draw the following conclusions. They do not regard all cases as operable, but think that many stones may be passed spontaneously by the muscular action of the ureter. If the stone, however, has remained a long time in the same place in spite of attacks of colic, or if it is movable and in a very much dilated ureter, an operation should be performed. In other words, only small smooth stones in non-dilated ureters give prospect of spontaneous passage. Fifteen of their cases were operated upon by extraperitoneal ureterolithotomy, in all of which recovery occurred without formation of fistula. These cases, with the sixty (one death) operated on in the same way by Jeanbrau, give a mortality of only 1.35 per cent which the authors think show very good results.

C. G. GRULEE.

**The Question of Primary Suture in Cases of Injury of the Lung** (Zur Frage der primären Lungennath bei Lungenverletzungen). DR. WILHELM WOLF. *Beiträge zur klin. Chir.*, bd. 86, h. 1, page 51.

Garré, in 1905, was the first to advocate active interference in cases of injury to the lungs, and reported eight cases. Wolf has been able to collect twelve more cases. Rupture of the lung, according to Richter, can occur in two ways. First: Indirectly, by bursting of the lung when subjected to compression. The glottis in such cases is usually closed reflexly at the time of compression, thus enormously raising the air pressure in the affected lung. Second: Directly, by puncture or laceration by a fractured rib. The conservative treatment of rupture of the lungs has had a mortality of fifty per cent. Aside from the immediate danger of hæmorrhage, serious secondary changes result, consisting in hepatization of the surrounding lung tissue, due to infiltration and aspiration of blood. The lacerated lung soaks up the effused blood like a sponge.

Rehn gives three indications for operation, namely:

1. Internal hæmorrhage, rapidly increasing or continuing so as to endanger life.

2. Severe hæmoptysis of such a degree as to be a menace to the other side from aspiration.

3. Rapidly increasing emphysema.

The operation is beset with two chief dangers, first, infection, and second, pneumothorax. Trendelenburg has ever maintained that the danger of a one-sided pneumothorax has been overestimated.

To lessen the danger of pneumothorax while operating, it is recommended to pull the injured portion of the lung into the wound, and later, after suture of the laceration, to perform a pneumopexy by suturing that part of the lung to the wound edges. It is claimed for this procedure that it favors the expansion of the collapsed lung and hastens the disappearance of the pneumothorax. This technique is especially valuable in cases where no pneumatic chamber is available in that it effects a closure of the pleura.

As to the indications for operation, Wolf states that naturally not every fresh case is in need of interference. Such cases should be very carefully watched and every change noted, so that the proper time for operation shall not be allowed to pass. Increasing pallor, cyanosis, dyspnœa, rapid weak pulse, and anxious expression, point to the continuance of the bleeding and make a thoracotomy urgent. Hæmoptysis is not to be depended upon as a sign, as it is often absent. The location of the incision is often determined by the presence of stab or gunshot wounds, and should always be long enough to give good exposure and make it possible to introduce the hand for the purpose of delivering the injured portion of lung.

Wolf reports three cases.

CASE 1. Severe crushing injury of the chest associated with a compound fracture of the fifth rib. There was much bleeding and increasing prostration. Under chloroform, with use of a pneumatic chamber the wound was enlarged, the bleeding portion of the lung pulled forth and the wound edges sutured with silk. The chest was sutured without drainage. The patient was very low but responded to stimulation and finally recovered completely from the injury.

CASE 2. Gunshot wound to the left of the heart; dyspnœa, small pulse, pneumothorax, profuse hæmorrhage from the wound. Osteoplastic resection of three ribs; the heart was found to be uninjured, but there was a large bleeding wound in the lung, which was sutured. The patient recovered.

CASE 3. Gunshot wound which entered between the fourth and fifth ribs one cm. to the left of the apex beat. Operation. Pericardium had been entered by the bullet which grazed the heart. The wound in the lung was sutured with silk, and chest closed without drainage. The patient recovered.

WILLIAM HESSERT.

**The Treatment of Chronic Purulent Inflammation with Beck's Bismuth Paste** (Zur Behandlung chronischer Eiterungen mit Wismutpaste nach Beck). H. H. SCHMID. *Wien. klin. Wchnschr*, 1911, xxiv, 232.

Schmid reports 15 cases of treatment by this method which cases had been under observation long enough to give definite ideas as to the results. In all, 29 injections. Of the 15 cases 7 were cases of spondylitis tuberculosis, 2 of caries costæ, 1 of caries oss. zygom., 2 of tuberculous abscess of the soft parts, 1 of osteomyelitis femoris, 1 of fistula after closure of a sacral anus, and 1 lung abscess. These cases constituted only half of those treated, but only those cases were taken which had been under observation long enough to permit of a judgment as to the effectiveness of the treatment. Of these 15 cases four were cured, 6 were essentially better and 5 slightly better.

In conclusion Schmid sums up as follows:

1. The bismuth paste of Beck is a method of treatment according to our experience without danger, painless, and pleasant for the physician and patient.

2. It is an admirable diagnostic aid for determining the size, course, and place of origin of fistulæ and abscesses, and therefore is of great value in placing the indications for a surgical procedure by preventing incomplete and therefore purposeless operations.

3. The method possesses an admirable symptomatic value, decrease of pain, secretion and eczema; in many cases complete healing results.

C. G. GRULEE.

**Transverse Fractures of the Patella without Separation of the Fragments.** A. E. JOHNSON. *Proc. Roy. Soc. Med.*, 1911, iv (Surg. Sect.), 69.

After a survey of the literature on this subject and reporting four cases, Johnson comes to the conclusions that the condition is more frequent than is commonly supposed. Diagnosis can be made only with the X-ray and union is bony. Treatment consists in a few days rest in bed after which a light removable plaster-of-Paris splint is supplied. Massage and active and passive movements are carried out daily. Treatment is continued for several months.

C. G. GRULEE.

# ABSTRACTS OF CURRENT LITERATURE

## DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. Bacon, M. D.
Heliodor Schiller, M. D.
Herbert Marion Stowe, M. D.
C. G. Grulee, M. D.

**Cæsarean Section or Hebosteotomy** (Kaiserschnitt oder Beckenspaltung). O. Pankow. *Zeitschrift für Geburtshülfe und Gynäkologie*, bd. lxvii, h. 1.

In spite of the great enthusiasm generated at the recent Dresden Congress over the value of hebosteotomy, the literature shows that the operation is gradually losing caste among clinical operators. This is probably due to the development of operative technique in the classical and extraperitoneal Cæsarean section. In the very recent literature, it appears that cases formerly calling for hebosteotomy are now being treated by extraperitoneal Cæsarean section.

From an experience of 21 cases of hebosteotomy Pankow lost four children including one death not traceable to the operation, a fœtal mortality of 19 per cent. All the mothers were saved but many suffered from complications. He states that hebosteotomy is contraindicated in both primiparæ and multiparæ when the fœtus is not in good condition. In three primiparæ where the head lay in the position of deep transverse arrest, in spite of a deep episiotomy, and in one other case where the incision extended "to the rectum," the forceps delivery was complicated by deep lateral tears, one of which communicated with the operation wound. The dangers of lacerations of the soft part is intimately associated with operative deliveries in primiparæ and leads to the statement that hebosteotomy is contraindicated in primiparæ no matter what the condition of the child may be.

In multiparæ, the danger of tearing is considerably diminished but still is present. In Kromer's report from Bumm's clinic, lacerations were found in seven out of ten cases and six of these cases were multiparæ. The forceps were used six times. The author states that hebosteotomy in multiparæ is only a preparatory operation and is not to be followed by operative delivery. If the fœtus is in danger, the operation is not called for.

A study of the complications due to or following the operation is of great value. Among these are found: needle, saw, and pressure injuries of the bladder and urethra; hematoma, tearing of the sacroiliac synchondrosis and the later results: thromboses, emboli, disturbances of gait and working ability, hernia, and prolapsus. Undoubtedly, many of these reported injuries are of minor degree and heal readily but others are of a serious character and interfere greatly with the well being of the patient. In order to avoid many of these sequelæ, Pankow advises hebosteotomy only in multiparæ when the fœtus head lies in the inlet with nearly the longest diameter engaged so that a separation of the pubic bone of two fingers will warrant a rapid descent into the pelvic cavity.

Regarding the danger of sepsis in Cæsarean section, Pankow states that septic peritonitis following the classical operation does not come from the liquor amnii that may soil the peritoneal cavity, but from the infective endometrium and the virulent streptococcus gains a passageway through the uterine incision. In the effort to avoid this incision, the extraperitoneal method was devised by Frank.

Concerning the value of Cæsarean section, the following conclusions are drawn: The classical Cæsarean section should be reserved in the future for placenta prævia. In the therapy of contracted pelves, the intraperitoneal cervical Cæsarean section is recommended. In clean cases, access to the uterus is obtained by the Pfannenstiel incision, longitudinal opening of the peritoneum, separation of bladder from uterus, a small incision in the cervical wall, pulling cervix upward by the finger in this opening, cutting cervical wall downward and delivering the fœtus. If the woman is a multipara and the fœtus is not in danger, hebosteotomy may be performed.

In unclean cases, no fever present, no odor to liquor amnii, but where labor has continued for a long time after the membranes have ruptured, and where suspicious examinations have been made, the intraperitoneal Cæsarean section is preferred if the parents desire a living child. In multiparæ, hebosteotomy may be done.

In infected cases, the conservative Cæsarean section and hebosteotomy are not permitted. Craniotomy is indicated when the heart tones have weakened and meconium is passing. If these fœtuses aspirate infected liquor amnii, they die soon after birth of septic pneumonia. If the mother desires a living child, especially if she be an old primipara, Cæsarean section followed by the Porro is always the best procedure.

Herbert M. Stowe.

**Modern Methods of Delivery in Contracted Pelvis.** HASTINGS TWEEDY. *Journal of Obstetrics and Gynæcology of the British Empire*, April, 1910.

This paper is reported in abstract in the transactions of the Royal Society of Medicine. The author sums up his remarks as follows:

1. Induction of premature labor is never advisable.

2. Perforation is not permissible unless the child is dead.

3. Version should never be employed as a treatment for contracted pelvis, but may still be performed for complications of labor, such as a prolapse of the cord, when associated with contractions of the first and second degree.

4. In the greater degrees of contraction time should not be wasted in an endeavor to obtain natural delivery.

5. In lesser degrees ample time should be given the woman to enable her to deliver herself, if possible. With the first appearance of fœtal or maternal distress operative delivery must be undertaken.

6. High forceps should never be applied until preparations are complete for enlarging the pelvis, when they may be tried tentatively.

7. In all obstetrical operations the best results can not be obtained unless gloves are worn.

8. Finally, it is only a matter of a short time before it will be considered criminal to perforate the head of a living child, and even to permit one to die because of delay in delivery, or from obsolete methods, will rightly be condemned.

CAREY CULBERTSON.

**Instrumental Uterine Perforation in Curettement** (Über instrumental Uterusperioration bei Abortesausraumung). R. SCHINDLER. *Der Frauenartz*, bd. 25, h. 9.

Perforation of the uterine wall during the operation of curettement is a relatively common disaster, occurring much more frequently than the literature states. as many of the fatal cases are doubtless not published. The perforation is effected with many instruments, sounds, curettes, abortion forceps, Hegar's sounds, laminaria tents, and rarely the fingers. While the majority of such accidents are caused by the lack of skill and undue force in operating, the vulnerability of the uterine wall may be such that even the expert operator may become a perforator. Pathological states of the uterus, especially carcinoma, sarcoma of the corpus, soft necrotic myoma, inflammatory processes, circulatory disturbances due to retropositions of the organ, and cirrhotic changes due to former operations are productive of a locus resistentiæ minoris, and indirectly lead to perforation.

Perforation occurs not uncommonly in the puerperal state when the characteristic softening of the uterus is present. The danger of such injuries consist in the possibility of severe hæmorrhage and sepsis. The small smooth perforations by the sound often heal spontaneously without reaction when the uterine contents are aseptic.

The prognosis depends upon an early diagnosis and the treatment instituted. An abnormal sinking of the instrument in the uterine cavity should create a strong suspicion of perforation. Sounding the tubes is a rare occurrence if, indeed, it ever happens.

When the operator has diagnosed a perforation, all further manipulation within the uterine cavity should cease. Additional curetting, intrauterine irrigation, or cauterization may result disastrously. The many fatal cases that come before the courts are sufficient evidence of this fact. In the absence of severe sepsis or hæmorrhage, the uterine cavity should be drained and the patient left alone. If the perforation is complicated or if sepsis is present, the abdomen is to be opened and the tear sutured or the uterus extirpated. A relatively uncommon complication is the pulling of a portion of the omentum into the perforation by the curette. Krusen reported such a case (laparotomy and recovery); Küstner two cases; Opitz one (death from hæmorrhage despite laparotomy) and Fleischmann one (recovery after reposition of the uterus and drainage). In one of Küstner's cases, the portion of omentum was left in situ and after the patient recovered, a second curettement was made and the omental tissue recognized in the scrapings. A vaginal extirpation was done and the omentum found in the healed perforation.

Schindler reports a similiar case. A local physician attempted to curette a uterus at the eighth week of pregnancy. The sound passed through the uterine wall and was palpable about three fingers' breadth below the umbilicus. She was admitted into the hospital at once. Her general condition was good, pulse normal, no fever. Internal examination showed some omental tissue lying within the cervix. During the next few days no change in her condition was observed. Later, a laparotomy was done and the peritoneal cavity found full of blood. A portion of omentum was found attached to the uterine wall entering a perforation about 1.5 cm. in diameter. This was removed and the patient made a good recovery. HERBERT M. STOWE.

**Extirpation of the Septic Uterus** (Zur Frage der Extirpation des septischen Uterus). G. SCHICKELE. *Beiträge zur Geburtshilfe und Gynäkologie*, b. 16, h. 1.

One of the most difficult problems in obstetrics is to decide when a septic uterus is to be extirpated to prevent a general infection of the patient or, in other words, to determine when a progressive infection is limited solely to the uterus so that its removal will terminate the septic process.

Schickele cites two cases showing that extension to the general system is at times so atypical that a decision to operate is nearly impossible. In the first case, temperature and rapid pulse were present on the second day. The woman was admitted to the clinic on the seventh day postpartum. The abdo-

men was soft and relaxed, not painful on pressure. No masses were palpable. The uterus extended one finger's breadth above the pubis. The parametrium and Douglas's pouch were normal. Blood culture negative. Bowels and urine normal. Appetite good. On the eleventh day she had a violent chill. Vomiting. Abdomen still soft and not painful. Blood culture again negative. Later, dulness was found in the left iliac region but the area was not painful. Moderate dyspnœa. Several attacks of vomiting. Death. The autopsy showed a puerperal endometritis, purulent metrolymphangitis originating from the placental site and extending into the left broad ligament. Here was found a small abscess. Diffuse suppurative peritonitis and enlargement of the spleen. The general condition of the patient from the second day to her death remained good. Extension of the infection from the uterine wall probably took place on the first day and yet the only signs of trouble were the temperature and rapid pulse. The symptoms of the spreading infection were in no way characteristic. The question is asked as to whether this woman could have been saved by extirpating the uterus, and when was the operation indicated?

In the second case, a multipara was treated for placenta prævia (breech extraction and manual removal of the placenta). Immediately after delivery a violent chill. Temperature 41.5° C., pulse 200, respiration 80. A chill occurred on the first two days. Pulse and temperature high. Marked dyspnœa and cyanosis. General condition grave from delivery. The uterus was not tender. Lochia putrid. No involvement of the parametrium. Abdomen negative. Death on the fourth day. Autopsy revealed a putrid endometritis, purulent metrolymphangitis and phlebitis. In the uterine wall only small abscesses. Parametrium free. Metastatic consolidation in the lungs, but no abscess, ecchymoses in the kidneys. Splenic enlargement. In this case, the manual removal of the placenta evidently precipitated a large number of bacteria into the uterine wall and blood stream. Schickele states that because of the collapse immediately following delivery together with the chill, fever, pulse, and poor general condition, the uterus should have been extirpated on the second day. At this time it is probable that the infection was confined to the uterus. He concludes, therefore, that in a case of intrauterine manipulation, especially manual placental removal, the signs of a severe infection or a rapidly weakening condition of the mother indicate the removal of the uterus.

In a third case of premature labor at the sixth month, the general condition was deplorable as shown by high fever, rapid pulse (150) and stupor. After a time the symptoms improved and the patient felt considerably better. Relief was only temporary and death occurred on the twentieth day. The autopsy showed the uterus and parametrium without signs of inflammation, no pus, practically normal. Multiple small pulmonary emboli, multiple suppurating pulmonary infarcts, and splenic tumor. This case shows that a severe infection can occur via the uterus without the uterus taking part in the process. In such a case, extirpation is useless, as the organ is not involved. The entire septic process is extraneous.

From the experience of these and several other detailed cases Schickele concludes as follows:

1. A severe puerperal infection can occur without the uterus being involved. The bacteria traverse the uterine wall rapidly and enter the blood stream at once. The first symptoms are general (streptococci in the blood and metastases). In such cases uterine extirpation is useless.

2. In high fever lasting several days, a spreading infection from the uterus is to be suspected. This suspicion will be strengthened by the appearance of peritoneal symptoms. According to these symptoms must be judged the indication, time, and method of operative measures. Uterine extirpation should not be attempted if the parametrium is involved or if a general infection is present.

3. If high fever follows intrauterine manipulation and chills appear or streptococci are found in the blood, an early operation must be done in the hope of preventing further infection or it may be delayed for a few days, not many, when signs of metastases appear. If chills appear or if streptococci are found in the blood primarily several days after the intrauterine manipulation and high fever persists, operation is indicated in the hope that the infection is still confined to the uterus and that its removal will terminate the septic process.

HERBERT M. STOWE.

**A Case of Post Abortum Puerperal Sepsis by Staphylococcus Aureus Hæmolyticus** (Ein Fall von Sepsis in Wochenbett nach Abortus durch Staphylococcus aureus hæmol.). DR. LARNERS. *Monats. f. Geb. u. Gyn.* b. xxxiii, h. 2.

A woman, 28 years old, iv-para, menstruated last three months before entering the hospital. Three days before entering she claimed she suffered a spontaneous miscarriage, at which time she had a high fever and chills, and there was a swelling of the elbow joint. On entering the hospital her temperature was 104°, pulse 140, there was fœtal lochia. In fact there were present all the symptoms of sepsis, and as well there were small pustules all over the body.

The bacteriological examination of the lochia, pustules, and the blood showed pure cultures of staphylococcus aureus hæmolyticus. This was verified at the postmortem. The place of infection was the endometrium. It was probably a case of criminal abortion.

HELIODOR SCHILLER.

# BOOK REVIEWS

A Manual of Obstetrics. By A. F. A. King, A. M., M. D., LL. D. Philadelphia and New York: Lea and Febiger, 1910.

King's Manual of Obstetrics has now reached its eleventh edition. This well known work was written primarily for the general practitioner and embodies the more essential points of obstetric practice. The main object is brevity and simplicity, and as such is easily understood by the general physician. Additions have been made on the subjects of pubiotomy, spontaneous version by posture, and the factor of thigh pressure upon the abdomen. The section on hyperemesis has been rewritten.

Attention is called to several points whose recommendation to the student and general practitioner is questionable. The application of forceps to the engaged and impacted breech is given as the operation of election. It is rare that such a breech cannot be delivered by traction with the fingers in the groin. The blunt hook on the living child is a serious procedure.

In the treatment of placenta prævia, while Braxton-Hick's version and rupture of the membranes are rightly given the preference, the use of ergot in ten drop doses every hour early in labor is open to discussion. The fact that the child is small and premature is given as the reason for this recommendation. The twice daily vaginal douches as a preventative against puerperal sepsis is recommended.

Especial attention is given to the preference of ether over chloroform. The use of chloroform in obstetric practice should grow less as its dangers become more evident. The physician who uses ether entirely in his practice will obtain far better results.

In the treatment of puerperal sepsis the statement is made that a thorough disinfection of the parturient tract from the vulva to the Fallopian tubes is of primal importance. This statement should apply *only* to cases where infection is limited to this organ and has not extended beyond. Otherwise, local therapy is useless and absolutely dangerous. It is impossible to sterilize the birth canal by any antiseptic or aseptic solution. The dictum that it is good obstetrics to irrigate the uterine cavity daily in *all* septic conditions is not acceptable. A sharp differentiation between localized and general infections is sometimes difficult even for the expert.

On other points, the general practitioner will do well to follow the teaching incorporated in the book and its continued popularity is based upon sound and practical advice and counsel.

Herbert M. Stowe.

Constipation and Intestinal Obstruction. By Samuel Goodwin Gant, M. D. Philadelphia and London: W. B. Saunders Company, 1909.

The author states: "Such flattering success has been mine with the non-medical and surgical treatment of these affections that I have thought it worth while to emphasize in this work the drugless management of constipation and obstipation. From what I have been able to find in the literature and from my conversations with medical men, in addition to my favorable experience, I feel that the manifold benefits to be derived from psychotherapy, diet and physical measures, such as bodily movements, massage, mechanical vibration, and electricity, have not received the marked attention they deserve by physicians in general when outlining a plan of treat ment for the relief and cure of the different types of costiveness. When discussing the various non-medicinal measures designed for the relief of this complaint I have endeavored to point out as closely as possible their exact indications, and to give briefly, in simple language, the technique of their application."

It has been the special object of the author in this volume to call particular attention to the various mechanical or surgical causes of constipation and make plain the steps in the different operations required for their correction or removal. He has refrained from incorporating a number of case histories partly because of lack of space and partly because usually case reports are not of interest to anyone but the physician.

The author states further: "Drugs are rarely employed by me in the curative treatment of constipation because I can obtain better results by non-medicinal, and when necessary, surgical measures; but I do resort to them occasionally in the symptomatic treatment of this affection."

For the benefit of those readers who are advocates of the management of constipation by medicine, or who, from lack of opportunity, are as yet unfamiliar with the various non-medical procedures and appliances for the relief and cure of this complaint, or not in possession of the required outfit, the author has devoted two chapters in the volume exclusively to the medical treatment of constipation. He discusses also the educational, prophylactic, psychic, dietetic, physical and medicinal treatment of chronic constipation, after which separate chapters

are devoted to the treatment of complications and consequences of constipation, spastic constipation, and the constipation of infants and children. Under treatment one chapter is devoted to psychic therapeutics, one to dietetic therapeutics, one to exercise and bodily movements, four to hydrotherapy, one to massage, one to mechanical vibration treatment, one to electricity and other physical therapeutic procedures, two as stated above on medicinal therapeutics, one on complications and consequences of constipation, one of constipation in infants and children, four on surgical treatment, other than the surgical treatment of malformations, one on congenital malformations, one on strictures and six chapters on the treatment of various ptoses, ending with a chapter on non-operative and surgical treatment of diseases of the rectum and anus.

The book is well illustrated and typographically is up to the usual mark of high class medical book making.

ANDREAS VESALIUS, THE REFORMER OF ANATOMY. By James Moores Ball, M. D. St. Louis, Mo.: Interstate Medical Journal Company, 1910.

This monograph, of quarto size, is printed on heavy imported tinted Normandy vellum, with deckle edge, and is bound in an appropriate heavy extension cover. The type is clear and of a size in harmony with the dimensions of the book. The typographical arrangement is excellent, and the printing exceptionally well done. The illustrations, of which there are more than fifty, not including the elaborate initials and tailpieces, are reproduced from the original publication of Vesalius, the Fabrica and Epitome, and from the original works of pre-Vesalian anatomists. The frontispiece is a photogravure of Vesalius, whose signature is also reproduced. Being printed on vellum, the appearance of the original engravings and of the printing of the sixteenth century is closely simulated. It is a de luxe volume and a very artistic production of medical literature, being of historical as well as practical interest.

OBSTETRICAL NURSING FOR NURSES AND STUDENTS. By Henry Enos Tuley, A. M., M. D. Second edition. Louisville, Ky.: John P. Morton & Company, 1910.

In this second edition of Tuley's Obstetrical Nursing the author has taken excellent advantage of his opportunity for a complete revision of the subject. To compile a text-book for practitioners or students is one thing, but to prepare a treatise on the same subject for the nurse is quite another.

To condense the subject matter of a seven hundred page work into a small volume of two hundred and fifty pages, to eliminate non-essentials wisely, to simplify elaborate scientific argument and description, all this is no light task. Hence, in the accomplishment of such an undertaking we need not be surprised to find that an author's conciseness may appear crude or that our own individual opinion may not be in agreement with certain brief statements.

A text-book for the nurse should be brief, concise, didactic, and in the present volume the subject matter is so prepared. The various phases of normal pregnancy, labor, and the puerperium are handled conventionally, a chapter is given to the child and one to infant feeding. Operative work and obstetric complications occupy two chapters, while advice to expectant mothers is the final one. An appendix and a glossary complete the volume.

CAREY CULBERTSON.

OPERATIVE SURGERY FOR STUDENTS AND PRACTITIONERS. By John J. McGrath, M. D. Third Edition. Philadelphia: F. A. Davis Company, 1909.

The author has endeavored to combine in a practical manner the subjects of surgical anatomy and operative surgery, following in the book his plan of teaching this subject at the New York Post Graduate School. The work, which is already in its third edition, has been considerably revised, and the chapter on abdominal surgery has been rewritten. In its present form it amply supplies the needs of students and practitioners doing work in operative surgery. The volume is complete without being to bulky, and the author has displayed good judgment in his selection of typical operations. The matter of including the surgical anatomy of the region under consideration contributes not a little to an understanding of the operation. While the book is freely illustrated, it is to be hoped that in future editions, the text will be abridged where possible and more illustrations added. The average surgeon in his perusal of the book will now and again find an operation which could be improved or modernized. Thus, in the chapter on hernia, there is no reference to the "imbrication operation" so superior to the original Bassini. Again, a better operation could have been found for circumcision. All things considered, the book fulfils very happily the mission its author intended, and it is to be hoped that it will retain its well deserved popularity.

WILLIAM HESSERT.

## BOOK RECEIVED

ON ACUTE INTESTINAL TOXEMIA IN INFANTS. By Ralph Vincent. London: Bailliere, Tindall & Cox, 1911.

# CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

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## THE PHILADELPHIA MEETING

The second meeting of the Clinical Congress of Surgeons of North America will be held this year in Philadelphia, November 7th to 16th inclusive.

Much of the preliminary work of the local Philadelphia Committee on Arrangements, under the chairmanship of Dr. John G. Clark, has been accomplished and is herewith appended. This preliminary report shows the comprehensive grasp the committee has of its problems and the members' enthusiasm argues well for the success of the next meeting.

The report on hospitals and clinics, under the chairmanship of Dr. Edward Martin, shows surgical clinics in all branches of surgery, to be conducted from 8 A. M. to 5 P. M. daily during the ten days' session.

These clinics will be manned by the leading surgeons of Philadelphia, representing all the teaching faculties in both undergraduate and graduate schools. The clinics will be conducted in the private operating rooms and large public amphitheatres of the private and public hospitals, aggregating a seating capacity of more than two thousand.

Evening meetings are being arranged under the supervision of Dr. George E. de Schweinitz, President of the College of Physicians of Philadelphia. Meetings on six evenings have been provided. These will furnish literary symposia on live surgical subjects which will give the visiting physicians an opportunity to hear papers and discussions by the leading surgeons of America and Europe who will be invited for the occasion.

The members of the Clinical Congress of Surgeons of North America are the readers of SURGERY, GYNECOLOGY AND OBSTETRICS (the official organ of the Congress) and those surgeons who register at any meeting of the Congress.

Invitations will be issued to physicians who may be interested to attend the Philadelphia meeting and who desire to become members of the Congress, if their names and addresses are sent to the General Secretary.

There are no yearly membership dues for the members of the Congress. A nominal registration fee to cover the administration expenses will be required of each member actually attending the meeting, which will entitle him to a ticket admitting him to all clinics, evening meetings, and social functions prepared for the Congress.

The subjoined program will be revised and amplified each month, and published in these pages until the final program is completed.

All communications of inquiry in regard to the Congress should be addressed to Dr. Franklin H. Martin, General Secretary, 1210 Columbus Memorial Building, Chicago.

# THE CLINICAL PROGRAM

A PRELIMINARY OUTLINE OF THE CLINICS, WHICH WILL BE REVISED EACH MONTH AS THE WORK OF THE COMMITTEE DEVELOPS

## HOSPITAL OF UNIVERSITY OF PENNSYLVANIA

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| C. H. FRAZIER | Clinical demonstrations. Laboratory demonstrations. |
| EDWARD MARTIN | Open treatment of fractures. Urinary calculi. Vasa-epididymostomy. |
| B. A. THOMAS | Results of cases treated, and a demonstration of dessication by the monopolar high frequency current of surface growths and hollow viscera neoplasmata, benign and malignant. |
| G. G. DAVIS | Treatment of tuberculous disease of hip and spine; congenital luxation of hip; paralysis from anterior poliomyelitis; operations for ankylosed and flail joints. |
| T. T. THOMAS | Shoulder injuries, two new operations. |
| JOHN B. DEAVER | Operations on the appendix, stomach and gall passages. |
| GEORGE FETTERHOLF | Clinical anatomy of thorax. |
| E. H. SITER | Genitourinary technique. |
| A. A. UHLE | Renal insufficiency. |
| W. H. MACKINNE | Urethroscope. |
| JOHN L. LAIRD | Cystoscope and catheterizing ureters. |
| ALFRED C. WOOD and E. E. ELIASON | Instruments: (*a*) Demonstration of a tourniquet for the control of hæmorrhage from the scalp during operations on the skull or brain. (*b*) Osteoplastic resection of the skull by means of an instrument operated by hand. Technique: A method of exposing the spinal laminæ. |
| J. B. CARNETT | Hernia: with operations, inguinal, femoral, and umbilical. Typhoid perforation and treatment. |
| C. C. NORRIS | Treatment of sterility and dysmenorrhœa by means of a new form of stem pessary. Review of all cases of latter condition. Gonorrhœa in women. |
| BARTON COOKE HIRST | Technique of hysterectomy for various indications; vaginal and abdominal hysterectomies; operative treatment of obstructed labors and placenta prævia; repair of the genital canal. |
| W. R. NICHOLSON | Methods of intrauterine bacteriological examination. |
| R. TAIT MCKENZIE | Treatment of flat foot, round shoulders, lateral curvature, or hernia, by exercise. |
| H. K. PANCOAST | Stereoscopic work. |
| GEORGE E. DE SCHWEINITZ and J. T. CARPENTER | Surgery of the eye. |
| T. B. HALLOWAY, CARL WILLIAMS and H. MAXWELL LANGDON | Demonstration of special methods of diagnosis. |
| J. E. SWEET and EDWARD MARTIN | Open treatment of fractures. Arterial suture. Vascular anastomosis. |
| GEORGE P. MULLER | Demonstration of patients operated upon for various joint lesions: tuberculous arthritis, ankylosis, rheumatoid arthritis, etc. Demonstration of certain malpositions and anomalies of the gastrointestinal tract with special reference to ptosis. Effect of salt solution, introduced intravenously, upon hæmolysis. Demonstrations in surgical pathology. |
| C. P. GRAYSON | Demonstration of correction of deflections of the nasal septum, with local, followed by general anæsthesia. Tonsillectomy versus tonsillotomy. The intranasal surgery of the accessary sinuses. |
| B. A. RANDALL and RALPH BUTLER | Radical tympanomastoid exenteration for middle ear caries. Surgical anatomy of the temporal bone. (Demonstration with specimens and lantern.) Diagnostic tests in otologic practice. The best every day treatment of chronic catarrhal and suppurative ear disease. |
| BROOKE M. ANSPACH | Perineal operations with adaptation of subcuticular suture. |
| FLOYD E. KEENE | Diagnosis of renal tuberculosis. |
| JOHN G. CLARK | Surgical phases of enteroptosis and other current clinical material. |

## JEFFERSON HOSPITAL

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| ORVILLE HORWITZ and HIRAM R. LOUX | Genitourinary clinic; alternate days; 1 to 2 P. M. |
| W. F. HANSEL and WILLIAM M. SWEET | Eye clinic; Nov. 8, 9 and 10; 2:30 to 4 P. M. |
| J. CHALMERS DA COSTA and CHARLES F. NASSAU | Surgical clinic; Nov. 8, 10, 13, and 15; 1 P. M. |
| JOHN H. GIBBON | Surgical clinic; Nov. 7, 11, and 14; 1 to 3 P. M. |
| H. AUGUSTUS WILSON | Orthopedic clinic; Nov. 7, 9, 11, 14, and 16; 10 to 11 A. M. |
| E. E. MONTGOMERY and J. M. FISHER | Gynecological clinic; daily; 9 to 11 A. M. |
| S. MCCUEN SMITH | Otological clinic; Nov. 8, 10, 13, and 15; 1 to 2 P. M. |
| EDWARD P. DAVIS | Obstetrical clinic; daily; 4 to 5 P. M. |
| D. BRADEN KYLE | Laryngological clinic; Nov. 7, 9, 11, 14 and 16; 1 P. M. |
| WILLIS F. MANGES | X-ray clinic; daily; 1 to 2 P. M. |

## MEDICO–CHIRURGICAL HOSPITAL

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| ERNEST LAPLACE | Surgical clinic; Nov. 7 and 11; 11 to 1 P. M.; Nov. 13 and 15; 9 to 11 A. M. |
| H. M. CHRISTIAN | Genitourinary clinic; Nov. 8 and 15; 11 A. M. to 1 P. M. |
| W. L. RODMAN | Surgical clinic; Nov. 8, 10, 14 and 16; 9 to 11 A. M. |
| J. P. MANN | Orthopedic clinic; Nov. 9 and 14; 11 to 12. |
| W. E. ASHTON | Gynecological clinic; Nov. 9 and 14; 12:30 to 2 P. M. |
| L. W. FOX | Eye clinic; Nov. 10 and 13; 1 to 3 P. M. |
| E. B. GLEASON | Otological clinic; Nov. 10 and 15; 3 to 4 P. M. |
| S. C. BURNS | Oral surgical clinic; Nov. 11; 9 to 10 A. M. |
| G. M. BOYD | Obstetrical clinic; Nov. 13; 12 to 1 P. M. |
| A. H. CLEVELAND | Nose and throat clinic; Nov. 16; 12 to 2 P. M. |

## POLYCLINIC HOSPITAL

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| B. F. BAER | Gynecological clinic. Nov. 7 and 14, 2 P. M. |
| L. H. ADLER | Rectal clinic. Nov. 7, 1 P. M.; 13, 2 P. M. |
| J. M. BALDY | Pelvic inflammatory disease. Uterine displacements and fibroid tumors. Nov. 9 and 16, 10 A. M. |
| JOHN B. ROBERTS | Surgical clinic. Demonstration of plastic operations on cadaver (laboratory). Plastic surgery of the face, exhibiting operations and results. Nov. 9 and 16, 11 A. M. |
| J. B. ROBERTS and L. W. STEINBACH | Surgical clinic. Nov. 11, 11 A. M. |
| F. R. PACKARD | Nose and throat clinic. Operations on the accessary sinuses. Demonstration in tracheobronchoscopy. Nov. 8 and 15, 3 P. M. |
| G. M. DORRANCE and N. GINSBERG | Demonstration of transfusion methods (laboratory). Nov. 10, 10 A. M. |
| G. M. DORRANCE | Demonstrations in operative gynecology (laboratory). Nov. 10, 3 P. M.; Nov. 16, 1 P. M. |
| R. BUTLER | Demonstration in operative surgery of the ear and mastoid (laboratory). Nov. 8 and 15, 4 P. M. |
| W. REBER | Ophthalmological clinic. Nov. 8, 1 P. M. |
| E. L. VANSANT | Nose and throat clinic. Submucous operations for deviation of the nasal septum. Nov. 8 and 15, 12 M. |
| J. A. KELLY | Demonstration in surgical pathology. Nov. 9, 1 P. M; Nov. 13, 12 M. |
| J. F. SCHAMBERG | Dermatological clinic. Exhibition of cases of lupus and skin cancer treated by X-ray and other methods. Treatment of angiomata and other nævi by solid carbon dioxide. Nov. 7 and 11, 12 M. |
| A. HEWSON | Demonstration in regional and surgical anatomy. Nov. 7, 3 P. M.; Nov. 14, 12 M. |
| L. W. STEINBACH | Surgical clinic. Surgery of the thyroid gland. Nov. 7 and 14, 11 A. M. |
| J. H. JOPSON and J. SPEESE | Surgical clinic. Treatment of pulmonary tuberculosis by nitrogen injections. Nov. 8, 11 A. M. |
| J. H. JOPSON | Surgical clinic. Nov. 15, 11 A. M. |

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| C. L. LEONARD | Demonstration in X-ray laboratory. Rapid stereoroentgenology. Nov. 7, 4 P. M.; Nov. 11, 1 P. M.; Nov. 14, 3 P. M. |
| A. A. SARGENT | Demonstration in refraction. Nov. 7 and 14, 10 A. M. |
| W. ROBERTS | Aural clinic. Nov. 8 and 15, 2 P. M; Nov. 13, 1 P. M. |
| WILLIAM R. NICHOLSON | Gynecological clinic. Cystoscopy and ureteral catheterization. Nov. 8, 11 and 15, 10 A. M. |
| M. B. MILLER | Surgical clinic. Hernia. Demonstration in operative surgery. Methods of intestinal anastomosis (laboratory). Nov. 10 and 13, 11 A. M. |
| J. K. YOUNG | Orthopedic clinic. Diagnosis and treatment of infectious arthritis. Tendon transplantation for infantile paralysis; Lange's operation. Nov. 9 and 16, 2 P. M. |
| A. W. WATSON | Nose and throat clinic. Nov. 9 and 16, 3 P. M. |
| W. M. SWEET | Ophthalmological clinic. Ocular injuries by foreign bodies. Nov. 10, 1 P. M. |
| W. M. SWEET and C. R. HEED | Demonstration in operative ophthalmology (laboratory). November 11 and 15, 1 and 4 P. M. |
| J. P. TUNIS | Demonstration in operative surgery of throat and nose (laboratory). Nov. 11, 3 P. M.; Nov. 16, 4 P. M. |
| B. A. THOMAS | Genitourinary clinic. Chromoureteroscopy, demonstrating carmine test. Intravenous use of salvarsan. Functional kidney diagnosis by the Duboscq colorimeter. The Wasserman technique. Nov. 10 and 14, 4 P. M. |
| W. C. POSEY | Ophthalmological clinic. Nov. 9, 4 P. M. |
| M. B. MILLER, R. M. GOEPP and J. A. KELLY | Arteritis obliterans. Exhibition of patients and specimens. Nov. 10, 12 M. |
| J. THORINGTON | Refraction. Nov. 10, 2 P. M. |
| G. M. COATES | Aural clinic. Nov. 11, 2 P. M. |
| J. S. GIBB | Nose and throat clinic. Tonsillectomy by modern methods. Nov. 13, 3 P. M. |
| G. H. MAKUEN | Faulty operations on the tonsils, and their effect on the soft palate and the voice. Nov. 13, 4 P. M. |
| T. ERCK | Gynecological clinic. Nov. 14, 1 P. M. |

## PENNSYLVANIA HOSPITAL

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| W. E. LEE | Surgical technique of the hospital. Surgery of the peritoneum; acute, localized, and diffuse inflammations; tubercular peritonitis. Cystoscopic examinations. Fractures and dislocations. Nov. 7, 13 and 15, 10 A. M.; Nov. 13, 3 to 4 P. M. |
| ROBERT G. LE CONTE | Tubercular glands of the neck; goiter. Surgery of the female perineum. Acute inflammations of bone. Nov. 7, 11 to 1; Nov. 11, 12 to 1; Nov. 16, 11:30 to 1. |
| DRS. PACKARD and COATES | Surgery of the ear, nose and throat. Nov. 7, 2 to 4. |
| FRANCIS A. PACKARD | Surgical diseases of the ear. Nov. 15, 2 to 4. |
| W. T. LONGCOPE | Surgical pathology. Nov. 8, 10 A. M. |
| JOHN H. GIBBON | Hernia; inguinal, femoral, umbilical. Malignant diseases; tumors of the breast. Surgery of the kidney, ureter and bladder. Nov. 8, 11 to 1; Nov. 13, 11:30 to 1; Nov. 15, 11 to 1. |
| DRS. SCHWENK and SHOEMAKER | Surgery of the eye. Nov. 8 and 13, 2 P. M. |
| DRS. ALLEN and ASHHURST | Fractures and dislocations. Nov. 9 and 10, 10 A. M. |
| EDWARD B. HODGE | Traumatic surgery of the lung. Club foot and tendon transplantation. Nov. 9, 11:30 to 1; Nov. 16, 10 to 11:30. |
| FRANCIS T. STEWART | Surgery of the heart and pericardium; thoracic aneurysm. Surgery of blood-vessels. Nov. 9, 2 to 4; Nov. 14, 11:30 to 1. |
| ARTHUR E. BILLINGS | Surgery of the female pelvis. Nov. 10, 11:30 to 1. |
| DRS. EVES and SCARLET | Surgery of the ear, nose and throat. Nov. 10, 2 to 4. |
| CHARLES F. MITCHELL | Surgery of the intestine; typhoid perforations. Surgery of the upper abdomen. Nov. 11 and 14, 10 A. M. |
| CHARLES N. DAVIS | Surgical diseases of the skin. Nov. 14, 2 to 4. |

## ST. JOSEPH'S HOSPITAL

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| J. M. Spellissy | Surgical clinic, Nov. 7, 9, and 14; 1 P. M. |
| M. M. Franklin | Surgical clinic, Nov. 7, 9, and 14; 9 A. M. |
| C. F. Nassau | Surgical clinic, Nov. 7, 9 and 14; 3 P. M. |
| E. E. Montgomery | Gynecological clinic, Nov. 7, 10 and 14, 11 A. M. |
| P. B. Bland and F. H. Maier | Gynecological clinic, Nov. 8, 9, 11, 13, 15 and 16; 11 A. M. |
| S. L. Ziegler and P. J. Pontius | Ophthalmological clinic, Nov. 8, 10 and 15, 4 P. M. |
| Dr. Jones | Ophthalmological clinic, Nov. 9, 11, 14 and 16, 4 P. M. |
| G. M. Marshall | Ear, nose and throat clinic, Nov. 7, 8, 11, 14 and 15, 9 A. M. |
| Dr. Senders | X-ray clinic. Daily at noon. |

## SAMARITAN HOSPITAL

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| Wilmer Krusen | Gynecological clinic. Nov. 8, 11 and 15; 12 M. |
| Guthrie McConnell | Demonstration of the surgical pathology of malignant tumors. Nov. 8, 2 P. M. |
| Collier Martin | Rectal clinic. Demonstration of results obtained in the treatment of fistula in ano. Nov. 8 and 15, 3 P. M. |
| W. Wayne Babcock | Surgical clinic with demonstration of segment anæsthesia by intradural injection. Demonstration of plastic or reconstructive surgery. Nov. 8 and 15, 4 P. M.; Nov. 11, 3 P. M. |
| Harry G. Duncan | Demonstration of cystoscopy and ureteral catheterization. Nov. 9, 1 P. M. |
| Nathan G. Ward | Use of high frequency currents and static wave current in the treatment of diseases of nose and throat. Nov. 9, 2 P. M. |
| Harry Hudson | Orthopedic clinic. Nov. 9, 4 P. M. |
| William H. Hitschler | Ear, nose and throat clinic. Demonstration of excision of the facial and pharyngeal tonsils. Nov. 10, 3 to 4; Nov. 13, 2:30 P. M. |
| William E. Robertson | Surgical errors in the diagnosis of intra-abdominal disease. Nov. 10, 4 P. M. |
| A. Parker Hitchens | Preparation of bacterial vaccines. Application of bacterial vaccines and allied products in surgical therapeutics. Nov. 10, 5 P. M.; Nov. 15, 2 P. M. |
| C. E. de M. Sajous | The rôle of the ductless glands in relation to surgical therapeutics, Nov. 11, 2 P. M. |
| William A. Steel | Genitourinary clinic, Nov. 13, 4 P. M. |
| J. F. Schamberg | Stereopticon demonstration of syphilis with special reference to the newer therapy. Nov. 13, 5 P. M. |
| Wendel Reber | Ophthalmic operative clinic. Nov. 14, 3 P. M. |

## PRESBYTERIAN HOSPITAL

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| George Strawbridge | Surgery of the eye. Nov. 7, 2 to 4 P. M. |
| W. S. Newcomet | X-ray therapeutics. Nov. 7, 2 to 4 P. M. |
| John H. Girvin | Gynecological clinic. Nov. 8, 2 to 4 P. M. |
| H. R. Wharton | Surgical clinic. Nov. 9, 2 to 4 P. M. |
| George Erety Shoemaker | Gynecological clinic. Nov. 10, 2 to 4 P. M. |
| D. B. Pfeiffer | Surgical pathology. Nov. 10, 2 to 4 P. M. |
| E. B. Hodge | Surgical clinic. Nov. 11, 2 to 4 P. M. |
| John H. Jopson | Surgical clinic. Nov. 13, 2 to 4 P. M. |
| George C. Stout and A. H. Cleveland | Ear, nose and throat clinic (surgical). Nov. 14, 2 to 4 P. M. |
| Frank C. Knowles | Surgical diseases of the skin. Nov. 14, 2 to 4 P. M. |
| William D. Rodman | Surgical clinic. Nov. 15, 2 to 4 P. M. |
| Richard F. Woods | Gynecological clinic. Nov. 15, 2 to 4 P. M. |

## WILLS EYE HOSPITAL

Ophthalmological clinic daily.

## JOSEPH PRICE PRIVATE HOSPITAL

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| JOSEPH PRICE | Gynecological clinic every other day. |

## GERMAN HOSPITAL

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| JOHN B. DEAVER | Surgical clinic every other day. |

## GYNECEAN HOSPITAL

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| J. M. BALDY | Supravaginal hysterectomy with anchorage of the cervix to the round ligaments in connection with plastic operations for uterine prolapse. Suspension of the uterus by posterior attachment of the round ligaments. Hysterectomy for carcinoma of the cervix. Hysterectomy for fibroid tumor of the uterus. Nov. 8 and 13, 10 A. M. |
| HENRY D. BEYEA | Suspension of the stomach for gastroptosis by plication of the gastro-hepatic omentum. Supravaginal resection of the uterus for fibroid tumor, with conservation of a part of the endometrial cavity and the ovaries. Nov. 9, 10 A. M. |
| THEODORE ERCK | Suspension of the kidney. Hysterectomy for pelvic inflammatory disease. Nov. 10, 10 A. M. |
| BROOKE M. ANSPACH | Cystoscopic examination and catheterization of the ureters. Vesico-vaginal interplacement of the uterus for cystocele and prolapse. Resection of excessive fat from the abdominal wall in connection with operation for ventral hernia. Nov. 11, 10 A. M. |
| GEORGE W. OUTERBRIDGE | Demonstration of interesting gynecological specimens. Nov. 14, 10 A. M. Demonstration of specimens removed at each operation and other specimens bearing on cases of the day, daily. |

## METHODIST EPISCOPAL HOSPITAL

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| J. B. ROBERTS | Surgical clinic. Nov. 7, 12 to 2; Nov. 14, 11 to 2. |
| JOSEPH SPELLISY | Surgical clinic. Nov. 9 and 16, 11 to 12 A. M. |
| J. T. RUGH | Orthopedic clinic. Nov. 8, 10 and 13, 11 to 12 A. M. |
| WALTER ROBERTS | Otological and laryngological clinic. Nov. 9 to 16, 1 to 4 P. M. |
| L. T. HAMMOND | Surgical clinic. Nov. 8, 10 and 13, 12 to 2 P. M. |
| J. P. MOORE | Ophthalmological clinic. Nov. 9 and 16, 4 P. M. |
| R. C. NORRIS | Gynecological clinic. Nov. 14, 2 P. M. |
| L. A. SALADE | Gynecological clinic. Nov. 13, 2 P. M. |

## EPISCOPAL HOSPITAL

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| H. C. DEAVER | Surgery of the female pelvis. Nov. 7, 2 to 4 P. M. |
| LOUIS MUTSCHLER | Surgery of hernia. Nov. 8, 2 to 4 P. M. |
| T. R. NEILSON | Surgery of the urinary tract. Nov. 9, 2 to 4 P. M. |
| G. ORAM RING | Surgical diseases of the eye. Nov. 10, 2 to 4 P. M. |
| CHARLES H. FRAZIER | Surgery of the stomach and duodenum. Nov. 11, 2 to 4 P. M. |
| C. Y. WHITE | Vaccine therapy. Nov. 13, 2 to 4 P. M. |
| C. C. BIEDERT | Surgical diseases of the ear, nose and throat. Nov. 14, 2 to 4 P. M. |
| A. P. C. ASHHURST | End results of fracture of the femur. Nov. 15, 2 to 4 P. M. |
| J. L. BROMLEY | Surgical diseases of the eye. Nov. 16, 2 to 4 P. M. |

## CHILDREN'S HOSPITAL

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| H. R. WHARTON | Surgical clinic. Nov. 7. |
| F. R. PACKARD | Nose and throat clinic. Nov. 8. |
| B. A. RANDALL | Ear clinic. Nov. 9. |
| J. H. JOPSON | Surgical clinic. Nov. 10. |
| W. C. POSEY | Eye clinic. Nov. 11. |
| E. B. HODGE | Surgical clinic. Nov. 13. |
| F. K. KNOWLES | Surgical skin affections. Nov. 14. |
| J. A. BABBITT | Nose and throat clinic. Nov. 15. |
| C. Y. WHITE | Surgical pathology. Nov. 16. |

### JEWISH HOSPITAL

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| W. H. Teller, E. L. Klopp, L. W. Steinbach and Dr. Stern | Surgical clinics. |
| E. L. Klopp and S. M. Smith | Otological clinics. |
| A. W. Watson | Laryngological clinics. |
| W. G. Elmer | Orthopedic clinics. |
| Isaac Leopold and J. C. Knipe | Ophthalmological clinics. |

### PHILADELPHIA LYING-IN HOSPITAL

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| G. M. Boyd and Stricker Coles | Obstetrical clinics. |

### HOSPITAL OF THE WOMAN'S MEDICAL COLLEGE

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| Ella B. Everitt | Gynecological clinic. Nov. 7, 9, 14 and 16, 1 P. M. |
| Margaret F. Butler | Laryngological and rhinological clinic. Nov. 8 and 15, 2 P. M. |
| Harry C. Deaver | Surgical clinic. Nov. 10, 1 P. M. |
| Emma E. Musson | Aural clinic. Nov. 13, 2 P. M. |

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## PHILADELPHIA SURGEONS WHO WILL CONTRIBUTE TO THE CLINICAL PROGRAM

Charles H. Frazier
Edward P. Davis
John H. Gibbon
Robert G. Le Conte
John G. Clark
George de Schweinetz
John B. Deaver
John B. Roberts
J. M. Baldy
Edward Martin
E. E. Montgomery
W. L. Rodman
Barton Cooke Hirst
Joseph Price
Brooke M. Anspach
Richard C. Norris
Stricker Coles
B. F. Baer
W. E. Lee
P. B. Bland
F. H. Maier
Collier Martin
W. Wayne Babcock
A. Parker Hitchens
H. R. Wharton
Henry D. Beyea
Orville Horwitz
J. Chalmers DaCosta
H. Augustus Wilson
Theodore Erck
Ernest Laplace
L. A. Salade
H. C. Deaver
A. P. C. Ashhurst
F. R. Packard
G. M. Boyd
B. A. Thomas
G. G. Davis
T. T. Thomas
George Fetterholf
E. H. Siter
A. A. Uhle
W. H. Mackinne
John L. Laird
Alfred C. Wood
E. E. Eliason
J. B. Carnett
C. C. Norris
W. R. Nicholson
R. Tait McKenzie
H. K. Pancoast
J. T. Carpenter
T. B. Holloway
Carl Williams
J. M. Spellissy
H. Maxwell Langdon
J. E. Sweet
George P. Muller
C. P. Grayson
B. A. Randall
Ralph Butler
Floyd E. Keene
Hiram R. Loux
W. F. Hansel
William M. Sweet
Charles F. Nassau
J. M. Fisher
S. McCuen Smith
D. Braden Kyle
Willis F. Manges
H. M. Christian
J. P. Mann
W. E. Ashton
L. W. Fox
E. B. Gleason
S. C. Burns
A. H. Cleveland
L. H. Adler
G. M. Dorrance
N. Ginsberg
W. Reber
E. L. Vansant
J. A. Kelly
J. F. Schamberg
A. Hewson
L. W. Steinbach
J. H. Jopson
J. Speese
C. L. Leonard
A. A. Sargent
W. Roberts
M. B. Miller
J. K. Young
C. R. Heed
J. P. Tunis
W. C. Posey
R. M. Goepp
J. Thorington
G. M. Coates
J. S. Gibb
G. H. Makuen
W. T. Longcope
P. N. K. Schwenk
W. T. Shoemaker
F. O. Allen
Wm. B. Van Lennep
E. B. Hodge
Francis T. Stewart
Arthur E. Billings
R. B. Scarlett
Charles F. Mitchell
Charles N. Davis
M. M. Franklin
S. L. Ziegler
P. J. Pontius
G. M. Marshall
Wilmer Krusen
Guthrie McConnell
Harry G. Duncan
Nathan G. Ward
Harry Hudson
William H. Hitschler
William E. Robertson
C. E. de M. Sajous
William A. Steel
George Strawbridge
W. S. Newcomet
John H. Girvin
George Erety Shoemaker
D. B. Pfeiffer
George C. Stout
Frank C. Knowles
Richard F. Woods
George W. Outerbridge
J. T. Rugh
L. T. Hammond
J. P. Moore
Louis Mutschler
T. R. Neilson
G. Oram Ring
C. Y. White
C. C. Biedert
J. L. Bromley
J. A. Babbitt
W. H. Teller
E. L. Klopp
A. W. Watson
W. G. Elmer
Isaac Leopold
J. C. Knipe
E. B. Everitt
M. F. Butler
E. E. Musson
Dr. Eves
Dr. Stern
Dr. Jones
Dr. Senders

## EVENING LITERARY PROGRAMS

IN SUBSEQUENT ISSUES THE NAMES OF THE SPEAKERS AND OTHER INFORMATION WILL BE ADDED

*Wednesday, November 8th, at 8:15* P. M. — PHILADELPHIA COUNTY MEDICAL SOCIETY.

SURGERY OF THE UPPER ABDOMEN:

(*a*) Surgery of the Stomach and Duodenum.

(*b*) Surgery of the Liver and Bile Ducts.

(*c*) Surgery of the Pancreas.

The discussion of each paper will be opened by a surgeon of prominence especially interested and active in the subject which is presented.

*Thursday, November 9th, at 8:15* P. M. — PRESIDENTIAL MEETING.

PRESIDENTIAL ADDRESS . . . . . A. J. Ochsner, M. D.

To be followed by two papers on live surgical subjects.

*Friday, November 10th, at 8:15* P. M. — PHILADELPHIA NEUROLOGICAL SOCIETY.

ALCOHOLIC INJECTIONS INTO THE GASSERIAN GANGLION.

SURGERY OF THE PITUITARY BODY.

EXPERIMENTAL FRACTURES AND DISLOCATION OF THE SPINAL COLUMN AND ITS OPERATIVE TREATMENT (WITH DEMONSTRATIONS).

*Monday, November 13th, at 8:15* P. M. — PHILADELPHIA ACADEMY OF SURGERY.

The subjects of this meeting have not yet been selected but three distinguished surgeons will present papers which will be discussed by surgeons equally distinguished and interested in the topics under consideration.

*Tuesday, November 14th, at 8:15* P. M. — PEDIATRIC SOCIETY OF PHILADELPHIA.

THE SURGERY OF CHILDHOOD.

*Wednesday, November 15th, at 8:15* P. M. — OBSTETRICAL SOCIETY OF PHILADELPHIA.

SURGERY OF THE TUBES AND APPENDIX.

ECTOPIC GESTATION.

SURGERY OF FIBROIDS.

On one of the evenings, not yet definitely selected, but probably either Wednesday or Thursday, the 8th and 9th inst. respectively, the Pathological Society of Philadelphia will prepare an exhibit of specimens especially relating to the surgical diseases which have been discussed, or are to be discussed, during the Congress.

Probably on Wednesday evening, November 15th, at 8:15 P. M. a special meeting of the combined Sections on Otology, Laryngology and Ophthalmology of the College of Physicians will take place in Thomson Hall, to which speakers interested in these specialties of surgery will be invited.

For each paper read, there will be a specially selected surgeon or physician to open the discussion.